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June 1960

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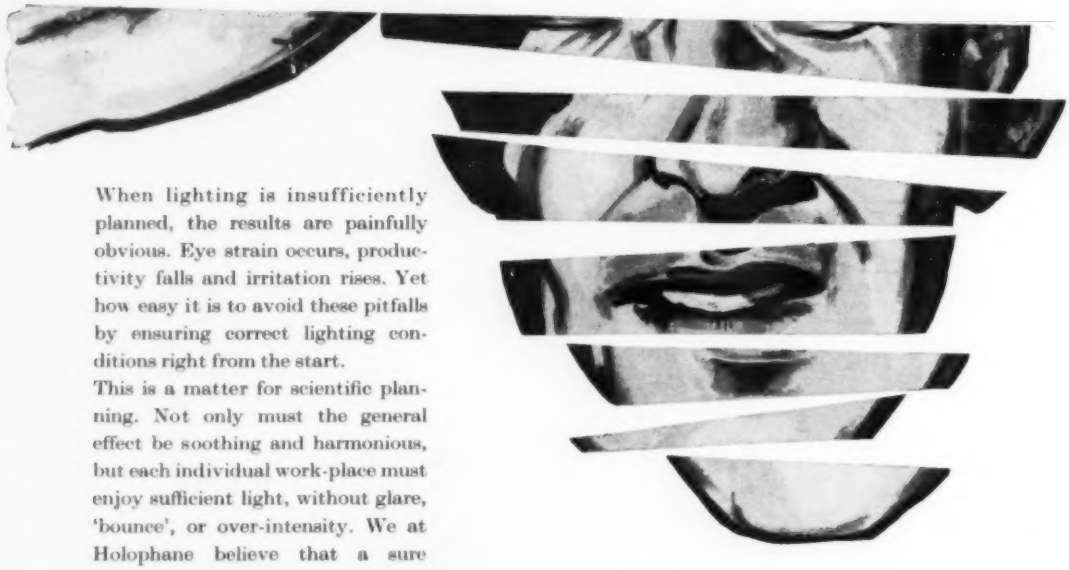

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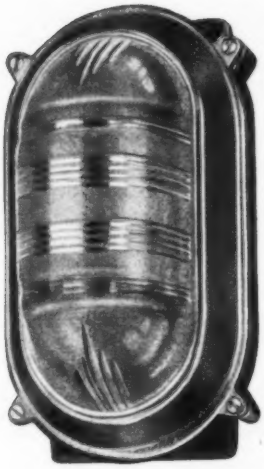

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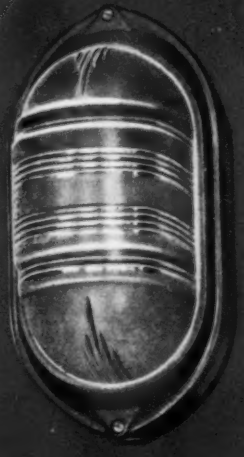

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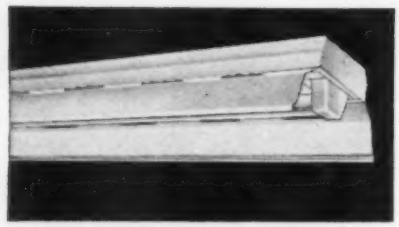

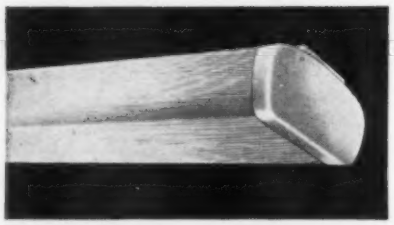

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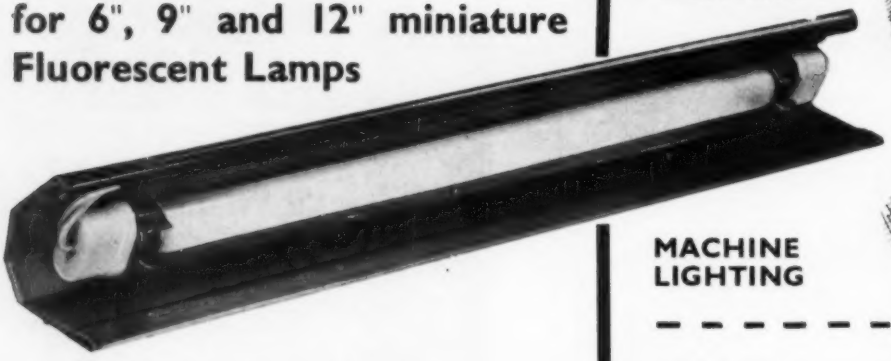

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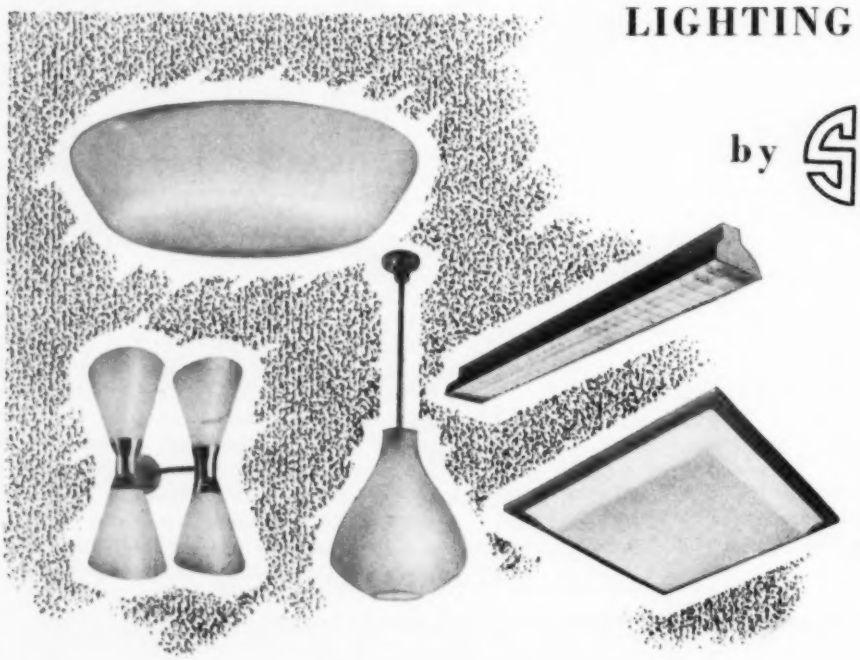

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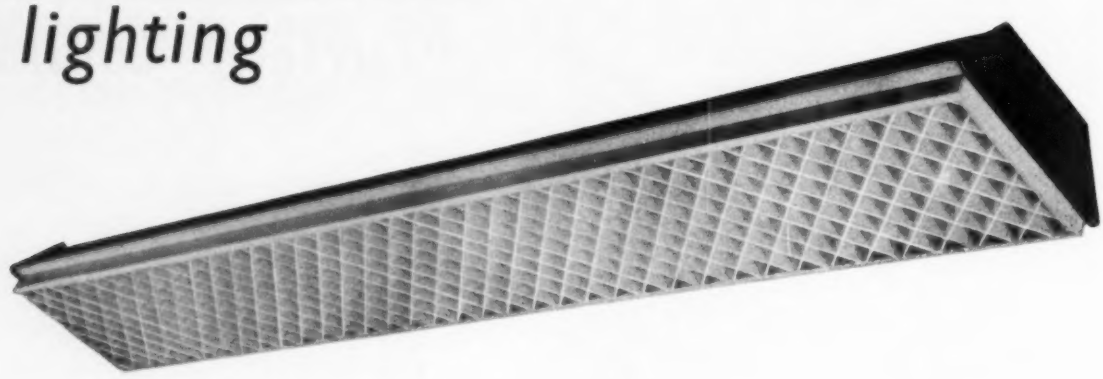

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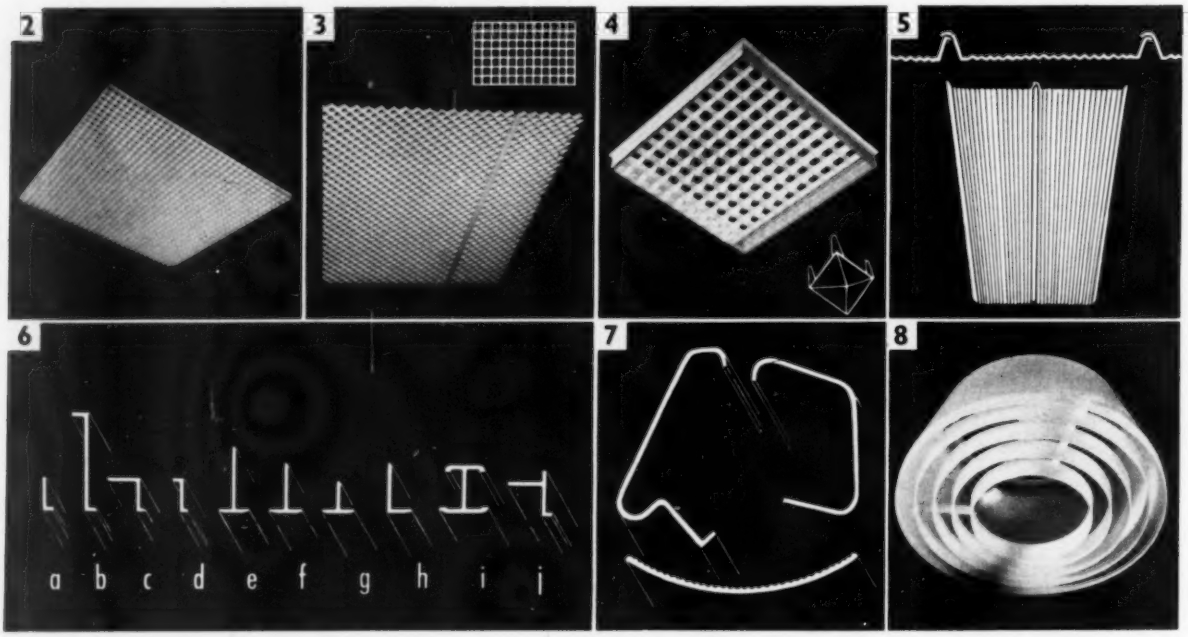

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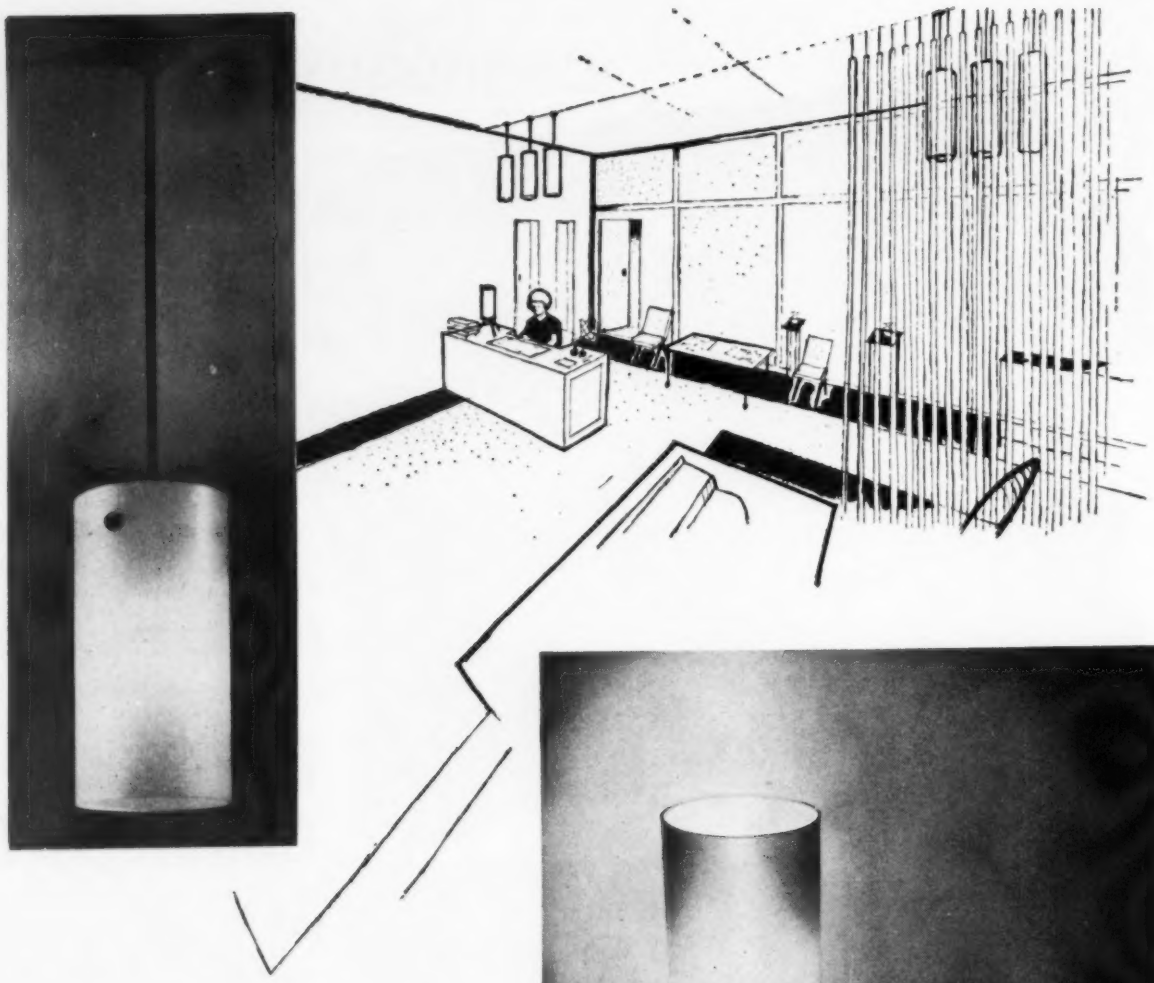

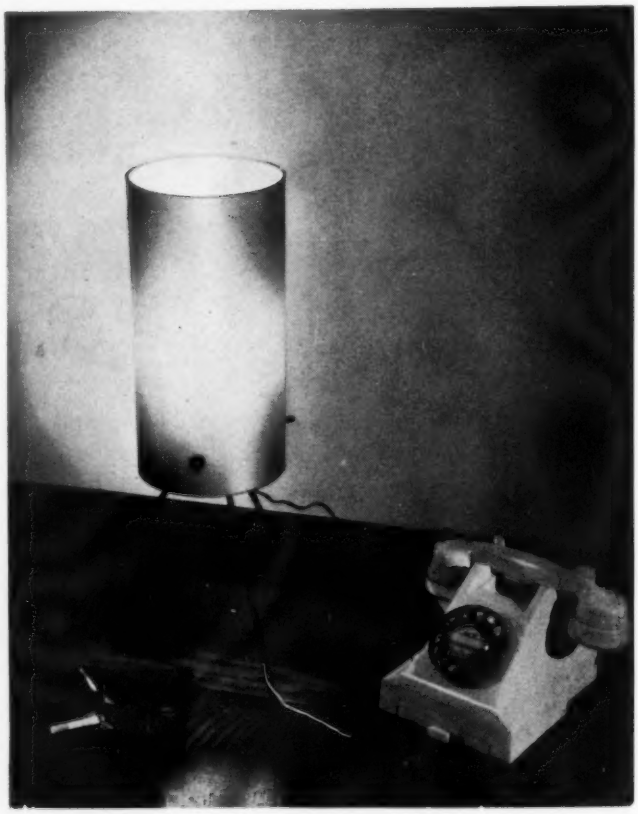

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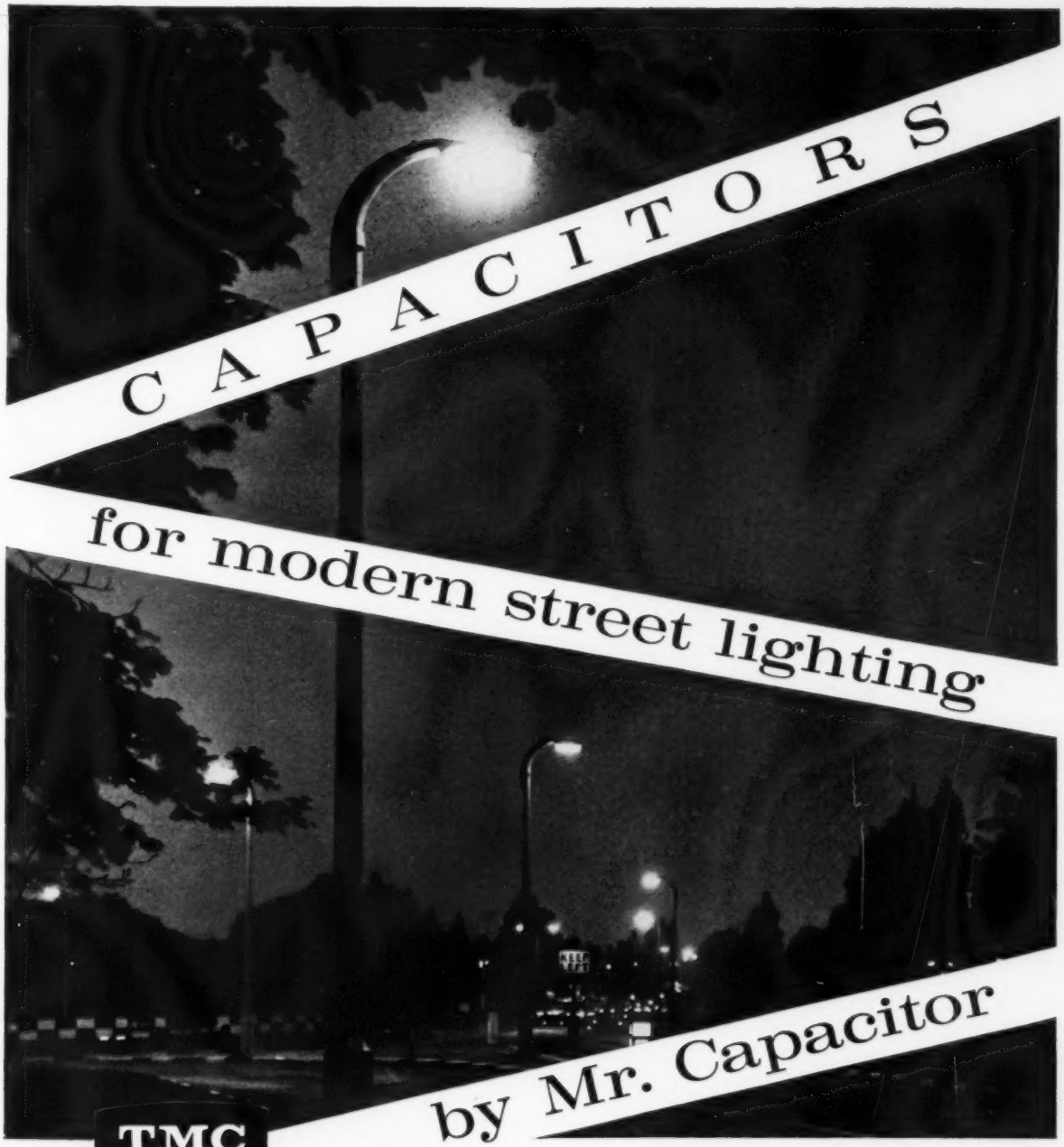

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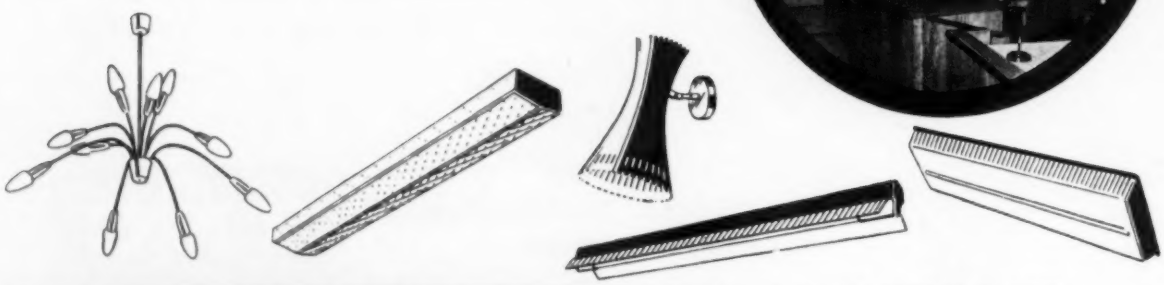

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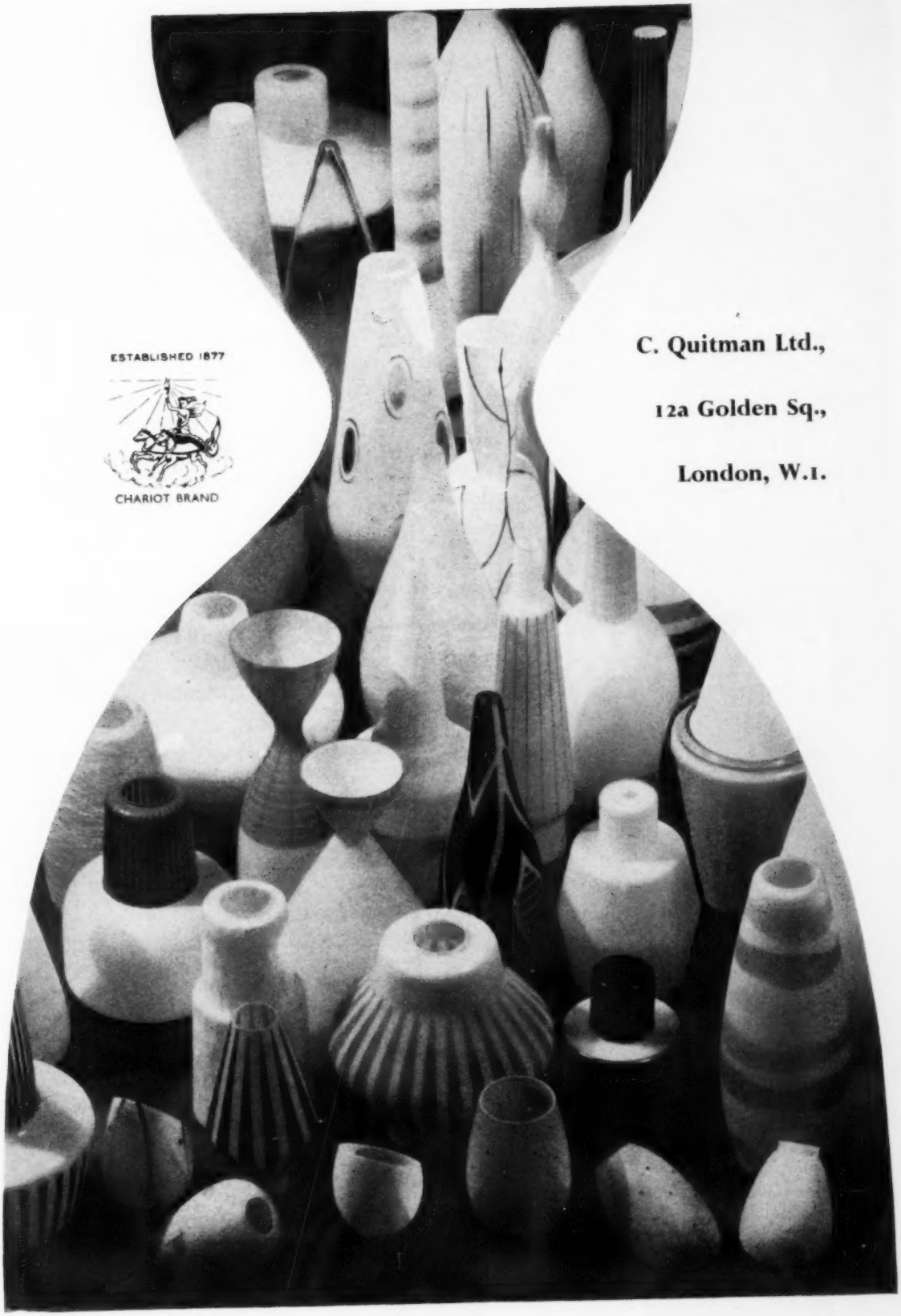

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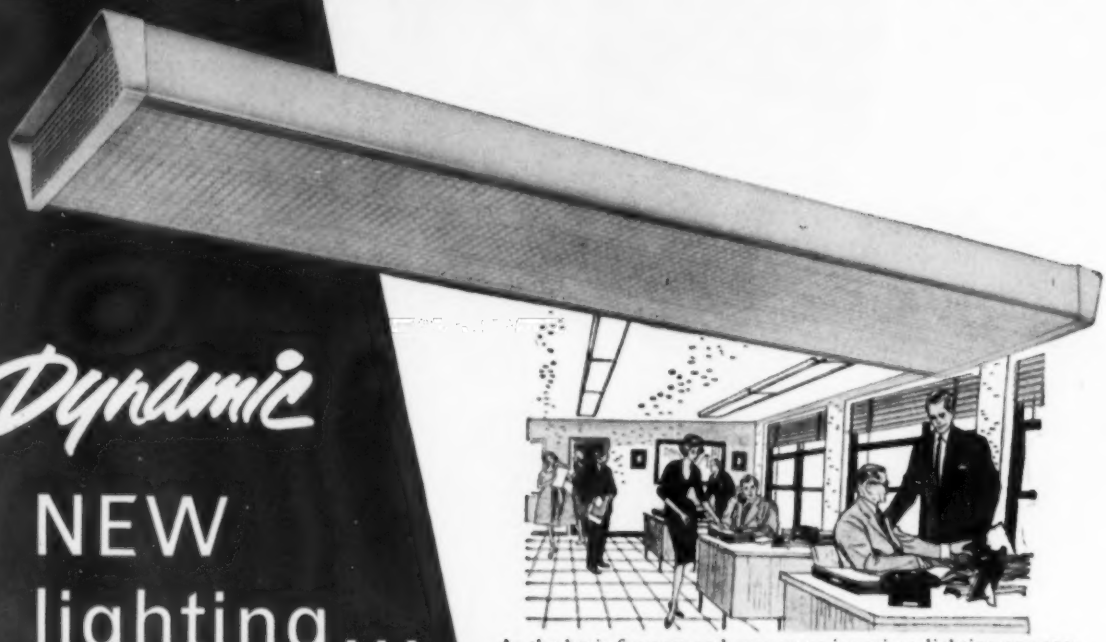

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Light and Lighting

Vol. 53 No. 6

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Published by The Lighting Press Limited, at 32 Victoria Street, London, SW1. Printed in England by the Shenval Press, Simson Shand Ltd, London, Hertford and Harlow.

Daylighting

ALTHOUGH the IES Summer Meeting last month was preoccupied with artificial lighting, daylighting did its best to make itself noticeable, as it usually does at this time of the year. It is understandable that lighting engineers pay no attention to providing good interior daylighting because they are given no opportunity to design the natural lighting 'installations' of buildings. They are more concerned to make up for deficiencies of daylighting by designing installations for artificial lighting which are supposed to provide 'adequate and suitable' lighting at any time. But do they? Do they provide all the features that we like in interior daylighting and so—in this sense—are they altogether suitable? Interior daylighting is usually from side lights and this often is helpful in avoiding reflected glare. It also gives better modelling than top lighting. These characteristics can be reproduced in artificial lighting and so can other features of daylighting. When daylong artificial lighting has to be used as the only or as the principal form of lighting in working interiors to what extent should it simulate daylighting? Should there be artificial windows? Should the ambient luminance be redistributed horologically, with or without the subtle changes of colour that daylight exhibits diurnally? If these are desirable how much do they matter? If they are luxuries or rarities today will they become 'necessities' tomorrow? It is not idle to pose such questions although we shall offer no answers to them: but they give food for thought.

Notes and News

HRH THE DUKE OF EDINBURGH visited the Design Centre in London on May 19 to present certificates to manufacturers whose products gained this year's Design Centre Awards. He also presented the 1959 Duke of Edinburgh Prize for Elegant Design to Mr C. W. F. Longman for his design of the Prestcold 'Packaway' refrigerator and announced that the 1960 prize has been awarded jointly to Neal French and David White for designing the Spode 'Apollo' range of dinner, tea and coffee ware.

Of particular interest to us is that of the eighteen Design Centre Awards, three were given to products of the lighting industry, all of which had been designed by Richard Stevens. These three products are illustrated on this page. The products and the judging panel's comments on each were as follows:

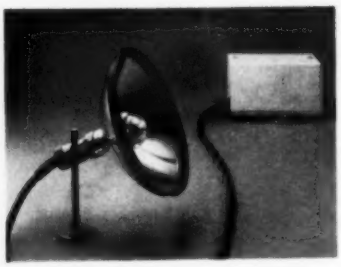
(1) 15 ft street lighting column NM510 with Gamma Five lantern—the award also including a 20/30 ft column with Gamma Four lantern. The columns are made by Abacus Engineering Ltd. for Atlas Lighting Ltd., who make the lanterns. Judging panel's comments: Here is a real contribution to the problem of street lighting. A row of small posts gives sufficient light without disturbing the street scene. It is particularly pleasing that, by producing these two related fittings (each of which is suited to the scale of its environment), the manufacturers have provided planners with the chance of relating the appearance of small domestic streets to that of main traffic roads. The relation of the base to the main post is more satisfactory in the smaller version. Although the toggle clips on it slightly spoil the relationship between the two circular forms of the lantern, they cannot be seen from the ground.

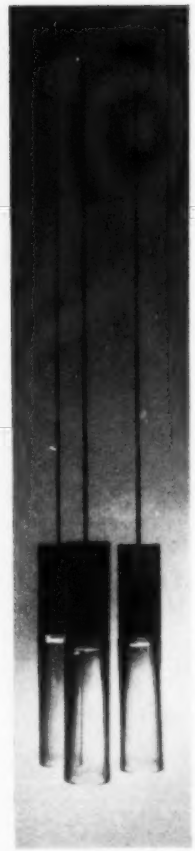
(2) Lighting fittings, 'Chelsea' range with JY glass units, made by Atlas Lighting Ltd. Panel's comments: Here is a new kind of decorative light fitting. The relationship between the sharp black metal and the thick coloured glass is attractive whether the lamps are alight or not, and the effect is rich when the specially-designed bulb throws light downwards into the hand-blown crystal glass, which can be clear, amber, pale rose or pale blue.

(3) Low voltage display fitting, made by Atlas Lighting Ltd. Panel's comments: This spotlight, which provides a narrow high-intensity beam with no glare, is unusually well designed for something made as a shop fitting rather than a consumer product. The anodized aluminium reflector has a matt black anti-glare ring and the mains transformer is finished with white and black stove enamel.

Richard Stevens and Atlas Lighting are to be heartily congratulated on their success.

Other products which received awards included an office desk, fabrics, table ware, glass, oven ware, a camera, a carpet and a wallpaper. The members of the Judging Panel were Misha Black, Mrs Jo Pattrick, Lady Casson, J. Beresford-Evans and F. H. K. Henrion. As in previous years, the judges were asked to choose designs from any of those shown in the Design Centre during 1959 which to their minds are outstanding for originality, workmanship, economy or some other quality which makes a real contribution to their industries.





Design Centre Awards for 1960 have been made for these three products; a street lighting column and lantern, a pendant lighting fitting and a low voltage spotlight.

The Beethoven Concert Hall in Bonn. The acoustic ceiling conceals 82 concentrating fittings housing 1,000-watt tungsten lamps; the ceiling is also directly lit by a number of concealed specular reflectors in the side walls. (Siemens-Schuckert photo.)

Electrical Engineers' Exhibition 1960

Two reviews of the exhibits at the exhibition organized by the A.S.E.E. at Earls Court in April as seen by (1) an architect, and (2) a lighting engineer.

(1) By Derek Phillips, ARIBA

IF LIGHTING EQUIPMENT MANUFACTURERS asked themselves last year whether it was all worth it, certainly this year some manufacturers had decided that the answer to this question is 'no' . . . for there were a number of notable absentees from the exhibitors. I was sorry not to see such companies as Frdk. Thomas, Hume Atkins and Oswald Holman. It was interesting, too, that at least one manufacturer considered that the Building Exhibition was of more importance for his particular needs than the ASEE, and this must surely be true where an appeal to architects is being made.

I saw comparatively few architects at Earls Court and a comment I heard from one of them seemed to sum up the general impression of the exhibition . . . 'all contactors and cable', which reinforced my own view that there seemed to be less lighting equipment than in previous years. There were fewer of those lavish home lighting fittings stands in the gallery, and it was easier on the feet.

Just as the Motor Show has lost some of its original glamour now that new models are produced at any time during the year, so I felt that there was less drama on the lighting stands at Earls Court now that new designs are no longer withheld until the exhibition; with the exception of the Courtney Pope stand where there is always much that is new. However for the person who catches up on lighting development once a year there was much of interest in the exhibition; and on many stands further gains have been made in the field of design. Stand design continued to be better and it was heartening to see that stands showing lighting equipment were leaders in well-designed, simple and straightforward stands. Leaving aside those of the large organizations I enjoyed the small scale stand of Hiscock Appleby, a stand which had been designed and made within their own organization, an example of what can be done using simple means to overcome the normally high cost.

One display technique also appealed to me; this was the use of illuminated vacuum formed vinyl panels as a background to lighting fittings.

Lamp Development

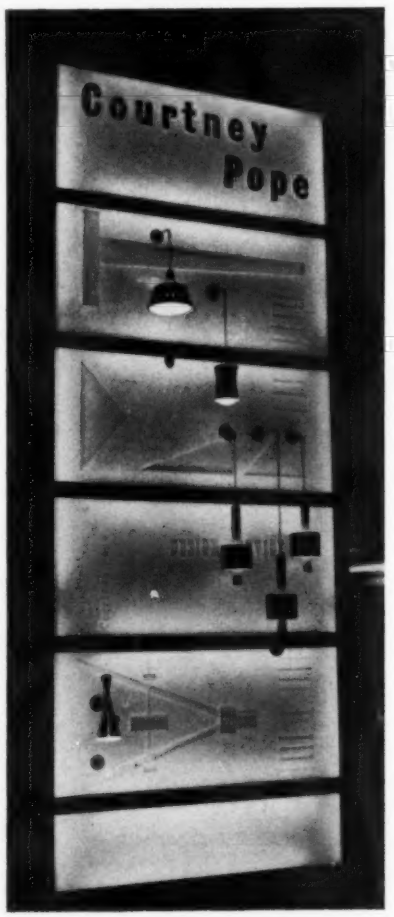
The most dramatic gains have been made in the sodium lamp, where AEI and GEC compete with Philips in producing the 'biggest isophot for a watt' with their 200-watt linear sodium lamps. The AEI and GEC claim an initial lumen output of 100 lumens/watt with a depreciation down to 88 lm/w at 4,000 hours, the rated life of the lamp; whilst Philips cap this with 102 lm/w initial and 90 lm/w at end of life. With efficiencies at '100 lm/w plus' people will be looking more at the other features in a choice between the lamps, such as the cost, and the nature of the possible optical control.

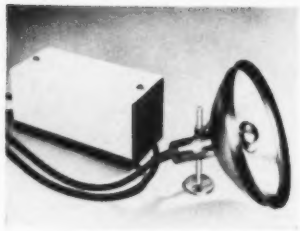
Philips also had a display of their PAR lamps which have not yet gained the popularity in this country that they enjoy both in Europe and in the United States for external and internal use. Their rugged nature and the optical control made possible in the construction appears to me to justify their increased price over the normal internally silvered reflector lamp. The GEC and Philips both showed their new mercury fluorescent lamps with internal reflectors which, with the Philips 375-watt high mounting reflector lamp, are indicative of a new approach to efficiency where lamps with integral reflectors are replacing a slightly more efficient association of lamp with an optical control system which requires maintenance. Is this perhaps a new approach to 'lighting without maintenance'?

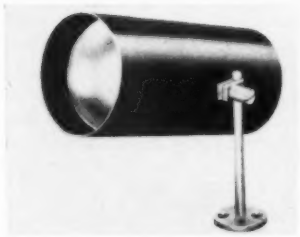
Atlas lighting had a particularly interesting display (with an excellent catalogue) of low voltage lamps and equipment; there is a great future for this form of lighting particularly now that the initial teething troubles associated with the lamp holders appear to have been solved by eliminating all current passing through the moving parts.

The DS/0050/L recessed gimbal fitting which uses the internally crown silvered 12-volt 50-watt lamp has many applications for display designers, as also has the smaller

Display technique—the use of illuminated backgrounds.

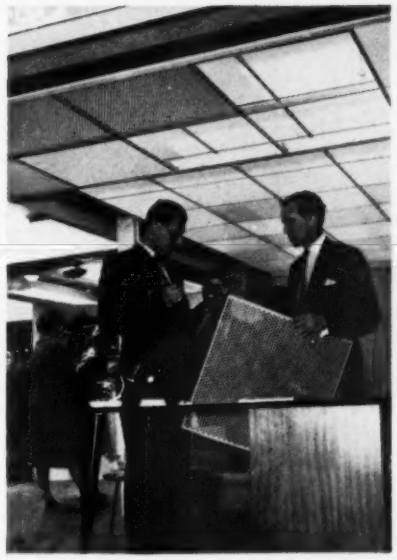


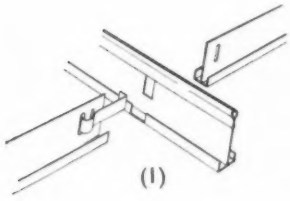


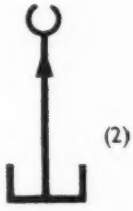


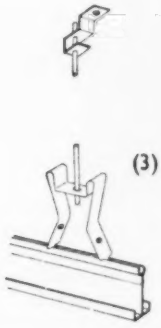
Above left, two Atlas low voltage spotlights; the lower one is only 5 in. long and less than 2 in. in diameter. Above right, Mr McNeill demonstrating the de luxe natural lamps with the aid of 'the twins' on the Atlas stand.

Right, Peter Hayes of Harris & Sheldon, demonstrating 'Circlgrid' to the author. Below, the 'Circlgrid' suspension system, (1) method of locking cross-tracks to main track, (2) cross-section of main track, (3) method of suspension.









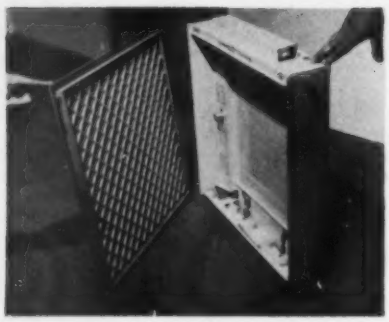
DC 0024 fitting with its 12-volt 24-watt lamp. This latter fitting, which has a length of only 5 in. and a diameter of under 2 in., can be run in pairs from a single transformer. The 12-volt 50-watt lamp was also exhibited in a number of simply designed holders. It is impossible to disassociate these lamps from their 'fitting' in that the 'fitting' is really nothing more than a lamp holder; the old conception of a 'fitting' being a necessary adjunct to a lamp, to distribute and control the light, no longer applies.

The battle for colour in the 'de luxe' ranges of fluorescent lamps was fought out chiefly by Philips and Atlas, the former with their double-coated Colour 32, and the latter with their new de luxe natural lamp. The Atlas display was particularly persuasive (how could it be otherwise with those twins), the display being associated with some clever engineering which managed to balance the level of illumination from each of 'the lamps to be compared' in such a way that the de luxe natural lamp always appeared to give more light . . . even though its luminous output is less than half that of a normal warm white lamp. The powers of persuasion being what they are we were led to believe that the appearance of food under the de luxe natural lamp was better than under any other fluorescent, or indeed under tungsten filament, light.

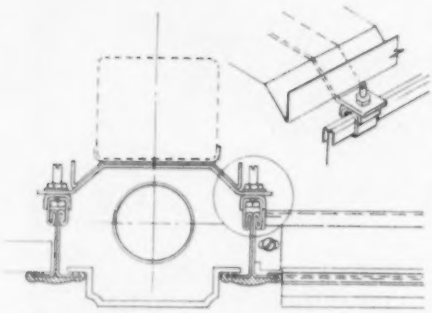
A further development in fluorescent lamps and their operation is in the various types of gear now available. The H. W. Field 'Resincast' choke which uses a special resin in a heat setting process, is now guaranteed to be replaced if faulty at any time—which should be good enough for anyone. The Philips gear has a cold setting polyester resin infilling and is guaranteed for one year, whilst the new Atlas gear has a spray varnish protection. Am I right in assuming that there is no British Standard which would ensure some degree of conformity? The Philips transistor gear for operating fluorescent lamps on DC supplies in railways and other places where such a supply is available was also shown.

Luminous Ceilings and Integrated Lighting

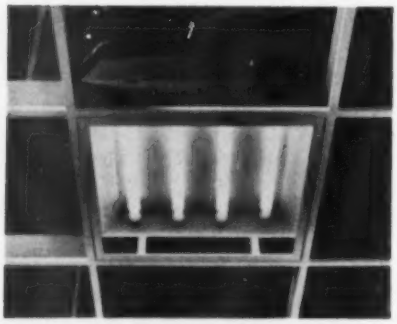
The newest development of considerable interest is the Harris and Sheldon 'Circlgrid'. This is a 'louvred' luminous ceiling based on a 2 ft. by 2 ft. grid, employing a specially fabricated diffuser panel of twin layers of vacuum-formed vinyl which are welded to a central membrane. The panels are formed into a series of indented circles and placed back to back, the centres being removed, leaving a series of ½-in. diameter circular louvres; the panels are sealed at the edges so that air and dust are excluded. This development comes from their association with the Wilson Co. in Canada and the suspension system is perhaps the neatest of its kind that I have seen. The special clip springs into a circular channel in the main suspension member and can be slid along



Revo module fitting showing the extruded aluminium edge trim. In this picture the movable gear tray is in position inside the box.



Section showing the thin line of light that can be obtained with the Ionlite ceiling.



The H. W. Field 2 ft. sq. fitting designed to fit into a 2 ft. grid of open-work wood members forming a 'Rotterdam'-type ceiling and an installation of the fittings.

to any desired position, the height of the clip being altered by pushing the clip together and sliding it up and down the suspension rod gripping in any position when pressure is released. The price at around 15s per sq. ft. without installation is frightening and it is to be hoped that this can be reduced. The great advantage that this type of ceiling has over the normal polystyrene louvre is the fact that the material is self-extinguishing and therefore can be used, as can other forms of pvc diffuser, where the LCC fire regulations apply.

Similar thought has been given to the various diffusers available from Courtney, Pope. Except for one design where the centre of the panel is indented higher than the sides, it is possible for all panels to have a clear sheet of pvc welded to the top, thus forming a double skin which is dust tight. This has a number of advantages: it is much more simple to clean than the indented patterns of the lower skin; when dust or flies collect on the flat top surfaces they are sufficiently diffused to be indistinguishable; and the panels are strengthened to avoid sagging . . . an advantage when it is desired to make panels 4 ft. or more square to achieve economies in suspension.

One further pvc ceiling was demonstrated in the design for the entrance hall, the now familiar 'Isora' ceiling, for which the lighting design is by the AEI Lamp and Lighting Co. A combination of self-coloured and blue panels was used which demonstrated the concealing powers of this ceiling.

The new 'Ionlite' ceiling was well hidden on the Falks stand, being placed over the bar, so that only the privileged few were able to study it in detail. (Architects had already had the opportunity to see this at the Building Exhibition.) It is a simple and cheap ceiling with much to recommend it and it was a pity that it was so poorly displayed. Ionlite have added to the design a special translucent extrusion which can be fitted between two of the suspensions on a special bracket which supports either a hot or a cold cathode fluorescent lamp so that thin lines of light can be placed in mainly opaque ceilings.

An addition to the range of openwork grid ceilings now available was one by H. W. Field which uses a box fitting designed to be placed into a 2 ft. by 2 ft. wood framework to form a Rotterdam-type ceiling. In the shop illustrated on the stand, wood was chosen for the framework as it was found to be cheaper than metal and more flexible when alterations have to be made.

There are a number of newcomers to the lucrative market for recessed fluorescent equipment. During the year Ekco-Ensign produced a revolutionary design of 'module' unit which allows the basic box to be installed first. This box is light in weight and easily handled, and also has a hole in the middle large enough for simple maintenance to be performed in the ceiling void after the ceiling had been installed. The reflector is installed next and the gear attached, after which the diffuser is dropped into place. The notion that the main body should be light in weight, the gear and reflector separate so that they can be removed for maintenance, and the additional access through the top to the ceiling plenum, has become the specification for the 'new module look' and fittings by Courtney Pope and others have followed. Perhaps the best made of these comes from Revo who have adopted the use of an extruded aluminium edge trim which is separate from the box. This enables a variety of edge conditions to be satisfied whilst retaining the same basic 'box' above, and the diffuser may be dropped 1 in., 2 in. or 3 in. below the ceiling level.

It was of great interest to see a large installation of the GEC comfort range recessed fittings used for lighting the GEC stand. This was designed to give a high level of functional lighting on the exhibits and was highly successful in not drawing attention to itself, its low brightness being in marked contrast to the glare and distraction of the lighting equipment elsewhere.

Lighting Fittings

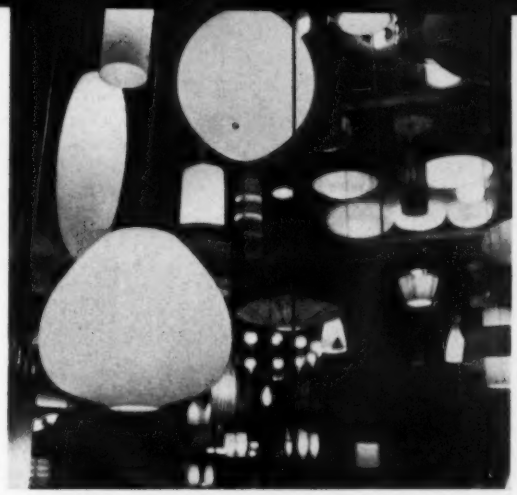
A rational division is taking place in the designs of lighting fittings into two broad groups, i.e. fittings which are designed to do a job of delivering a high proportion of the light from the lamp in a desired distribution, and fittings whose primary purpose is to look well when lit. In the first case the fittings are designed to be efficient, in the second they can be very inefficient, but in both they can be essentially functional.

Decorative Fittings

Decorative fittings are becoming more decorative, as typified by the Atlas 'Chelsea' range of glassware in which the light from the lamp concealed in a black cylinder illuminates a piece of chunky 'bubble glass' hand-made by Whitefriars Crystal in a number of beautiful colours.

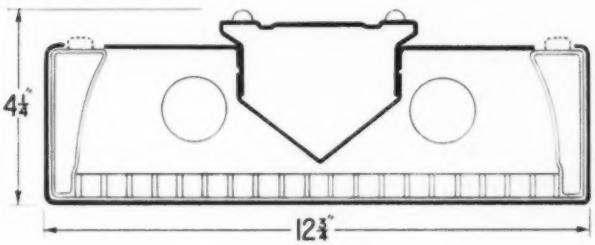
A second range of coloured glass is also marketed by Atlas, called the 'Finlandia' range as the glass comes from Finland; the fittings are similar in form and colour to those which have been available for some time from Orrefors in Sweden and comprise a smoky-coloured transparent outer glass with an inner glass of white opal which hides the lamp.

There was much coloured glass at the exhibition, some good colour generally from the Continent, and some less good. Hiscock Appleby showed a wide variety of decorative fittings with an extensive range of German Putzler glass. Putzler are just entering the coloured glass field but at present seem more at home with their white satin opal which they supply to many different manufacturers here. Troughton and Young showed their Harlequin range glass



Above left, three variations from the Atlas 'Finlandia' range; centre Courtney, Pope TF 80 spotlight; right, a profusion of decorative glass from Germany and elsewhere on the Hiscock Appleby stand.

Right, the new 'Floline' fittings (left-hand row) on the Benjamin stand; below, section through the fitting.



in a number of colours, and coloured glass fittings were also shown on the stands of Courtney Pope, Falks and others. Homeshades were lacking in their normal exuberance and exhibited only two fittings both of which come into this category, an over-ornate crystal chandelier and a more restrained modern design.

The new 'Italian' range of fluorescent fittings by Lumitron demonstrates the danger of trying to make decorative fittings efficient, or alternatively efficient fittings decorative whichever way you look at it. The results are curvilinear plastic and Russian-style chandeliers with brassy trimmings.

One further range must also be mentioned since its main purpose appeared to be to draw attention to itself. This was the 'Vistalite' range of fittings by Courtney Pope based on a square section of diffuser around a fluorescent lamp, at either end of which was a brightly coloured box of similar section containing the control gear. Some of the fittings had added features to enable them to be used as vertical ceiling pendants or floor standards. The effect of the glossy painted ends was startling to say the least.

Efficient Fittings

The best of the efficient fittings are those which do their job with the minimum of fuss, and of these I would select the new Benjamin 'Flo-line' as being the newest fitting to do just this. The fitting appears to have a strong transatlantic flavour since it is designed specifically for joining into long lines or for making up into squares and other patterns. The fitting is based on a twin lamp channel for two 5-ft. 80-watt fluorescent lamps, gear being placed down the centre. The lip-over diffuser is also of interest since it is made using the new ½-in. mesh Elcoplas louvre with extruded diakon sides. The sides are hollow and give excellent diffusion, the whole fitting being shallow, and when suspended off the ceiling, giving good upward distribution to help balance the ceiling brightness. (It has always been a wonder to me in the past that manufacturers here do not design fluorescent fittings for joining into extended lines as in America.)

Atlas and Ekco showed their 'superslim' ranges of fluorescent batten fittings which were brought out during the year with accompanying diffusers and reflectors. They are well designed and a most useful tool for use in many different applications. A circle of derivative friends was to be seen on a number of other stands.

A new 'family range' of fittings from David Carter at Revo is another well-designed addition to the numerous ranges of 'fluorescent battens plus'. This 'Versalite' range caters for both single and twin lamp fittings in 2-ft., 3-ft., 4-ft. and 5-ft. lengths and is simple and neatly designed.

In the tungsten filament field I have already mentioned the low voltage range of equipment designed to produce high intensities of light from small sources of low wattage. In addition to this there were many well-designed shop and display fittings on a number of the stands. A small fitting which particularly appeals to me is the Courtney Pope TF 80 available to take the 75- and 100-watt, or in a larger size the 150-watt, internally silvered reflector lamps.

An addition to the range of fittings which conform to the Ministry of Education's brightness distribution standards is that by Troughton and Young. This consists of an injection moulded polystyrene shade supported from a silver anodized aluminium tube. The fitting can be suspended on rod

Peter Sharp demonstrating the new Troughton & Young S22 range of tungsten lamp school lighting fittings.

or flex or can be ceiling mounted. The price of the S.22 fitting is 30s complete (5s of this being P.T.).

The design of bulkhead fittings is undergoing a revolution and the traditional patterns of prismatic glass are giving way to more simple shapes, both for tungsten filament and for miniature fluorescent lamps. A wide range of bulkhead fittings was shown on the Heyes stand, including their 'Ovalacent' range designed to take a diffuser of opal 'Perspex. or frosted glass. Heyes also showed their fluorescent bulkheat fitting for two or three 8-watt 12-in. fluorescent lamps and a fitting designed to take two 13-watt 21-in. lamps.

Holophane showed their control panel lighting fitting. This is really an integrated lighting unit designed for recessing into a suspended ceiling but it has a place amongst the 'efficient' fittings as a special refractor plate gives an asymmetric distribution to give even light down the length of a control panel.

Conclusions

The theme of the Electrical Engineers Exhibition this year, that of Marine Engineering, did not come over to me at all, and other people who visited the exhibition asked me what the theme had been this year. The central feature, however, was most successful, a giant chandelier by McGeoch, designed by J. W. Baseley, MSIA. The chandelier was 52 ft. high with a diameter of nearly 30 ft., quite an engineering feat. Even such a large fitting was almost lost in the volume of Earls Court and the best views were seen through stands from underneath where its huge scale was more apparent.

Some improvement in the design of catalogues was apparent and I would mention two manufacturers for special praise. The new ceilings catalogue of Courtney Pope sets out the information under the headings Components, Design and Construction, and this should prove of considerable value to architects. I see that the name of John Bickerdike, ARIBA, appears as consultant to this firm—further evidence that architects can be of assistance in this field. The new Revo catalogue is a departure from the size of the majority of others in that it is smaller and more compact (8¼ in. by 6 in.). The information is set out clearly although it does not attempt to include photometric data as does the Atlas catalogue.

Finally there was an interesting display of electrical 'unsafety' in the educational section. I liked particularly the bed warmer made from a tin hat with a brick inside, connected up with a mouse trap. Perhaps the best lighting story, however, was the gas lighting fitting, converted with a masterly stroke of the 'do-it-yourself' art into an electric light fitting but leaving the gas light still connected. It's certainly something one wouldn't think of; an answer to the architect's prayer for the 'quality of the flame source' combined with the 'efficiency of the tungsten lamp'!

ELECTRICAL ENGINEERS' EXHIBITION (cont.)

(2) By J. B. Harris, AMIEE, FIES

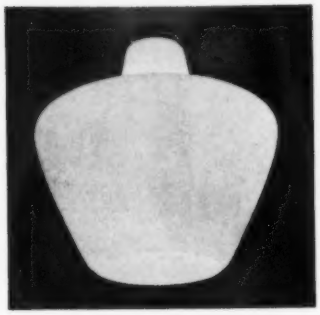
THERE WAS GOOD REASON FOR THE VARIED arrangement of the stands at Earls Court but for the specialist lighting engineer a much more compact grouping would be preferred. This year clearly indicated that even a full day was not enough to adequately cover the thirty-five or so exhibitors whose interests are devoted to, or are in some way connected with, lamps and lighting. On these grounds I must be excused if I fail to refer to a particular firm or new product.

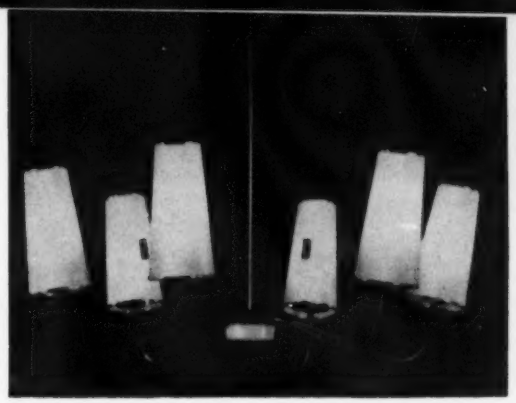
Such was the galaxy of equipment on show that one wonders whether there will be any further need for the practising architect or engineer to design a 'special'. Somewhere in a catalogue there will surely be a proprietary unit which will fulfil the consultant's needs in shape, size, colour, finish, lamp rating, fixing arrangement and, of course, price. Many of the standard fittings have in fact resulted from an original demand for a 'special'; so being the individuals we are it will be no surprise if next year there are more new ranges—which naturally will be better than the previous year's models.

The exhibition hall itself was dominated by the biggest aspid—sorry—electrolier, in the world. With a height of 52 ft., a diameter of 28 ft. 6 in., and enough wiring to cover the length of Southend pier, it certainly was the biggest thing in luminaires that I have ever seen. Congratulations to Mr J. W. Baseley the designer, and William McGeoch the manufacturers.

This year's emphasis in the fluorescent lamp field was on colour rendering and once again we are being persuaded that with the new de luxe natural tube we can get the best of both tungsten and natural lighting. Certainly under this lamp food appears fresh and appetising and there should be few colour complaints from fishmongers, florists and provision shops. A special display by Atlas to show the colour rendering qualities of the lamp on materials, furniture and food included the viewing of identically furnished rooms under different light sources. The lamps are available in 40-, 80- and 125-watt ratings and light outputs are about half those of equivalent white or warm white lamps. Light emission is still more efficient than with tungsten lamps, however, so provided that domestic decorative fittings can be produced the de luxe lamps still have a number of worth-while selling points. The main query now arising in the engineer's mind is 'where do we go from here'. Surely three of the present range of 'whites' could be eliminated, thus easing the stocking and storage problems of the wholesaler, contractor and house engineer.

Although the sodium lamp was first used in this country in the early 1930s, it is only in recent years that its value in street- and floodlighting has been universally acclaimed. Consequently it is now receiving more attention by lamp research engineers and a hitherto small and intimate family of four is rapidly growing. The 3-ft., 200-watt (100 lm/w initial efficiency), double cap, medium bi-pin sodium lamp is now supplied by AEI and GEC. The latter also have a 280-watt sodium lamp which consists of two 140-watt U-shaped tubes neatly housed in an envelope no larger than that of the 140-watt integral sodium lamp. Philips showed a 280-watt rating consisting of two standard U-tubes assembled end-on,





Left, S.L.R. Electric new school lighting fitting. Centre, Troughton & Young plastic diffuser for 150/200*-watt tungsten lamps. Right, one of the range of GEC 'Variform' fittings.*

resulting in a linear source 943 mm. in length. Philips also showed another sodium lamp of 200-watt rating of U-tube construction, for which they claim an initial efficiency of 102 lm/w. This lamp has a single BC cap and a length of 775 mm. Although these new lamps have been developed to meet the needs of better highway illumination, they should be found of advantage for façade and yard lighting and for exterior building operations.

In the mercury lamp range there have been improvements in the red light content of the fluorescent types. Some of these lamps now have a colour rendering quality similar to that of a daylight fluorescent lamp and consequently they should be found very useful in the industrial lighting field. In one type, now available in both 250- and 400-watt ratings, an internal reflector has been included. As the fluorescent phosphor has only been applied to the top reflectorized portion of the bulb colour rendering is not as good as with the completely fluorescent coated types. The lamps are specially suited to high bay mounting where cleaning and maintenance are major problems.

Philips, the pioneers and sole suppliers of the 'gearless' fluorescent lamp circuit, are now offering a circuit in which the special tungsten lamp ballast is replaced with a standard choke. Called appropriately (?) a 'Gearless on Gear' circuit this arrangement is claimed, according to circumstances, to have several advantages. One claim is that both the cost and the bulk of the control gear is reduced. Since p.f. condensers are required (and for some lamps an additional starting condenser) I wonder whether in actual fact there are any worth-while advantages. Much depends of course on the conditions of the particular installation. From many points of view it would be a good day's work if someone invented the ballastless fluorescent lamp. Couldn't we get all the necessary current controls into the end caps and/or lamp holders? The Philips transistor ballast, which operates standard fluorescent lamps from a 12- or 24-volt battery, opens up another useful market in the vehicle lighting field.

Lighting Fittings

Many firms produce fluorescent lighting fittings for use in corrosive industrial atmospheres, but the pvc sheath types made by Simplex are alone in their field. Single and twin tube 8-ft. battens have now been added to the ACF range, which indicates that there is now an established industrial demand for the 125-watt fluorescent lamp. The construction of these units is such that access to gear is not possible, but this will not worry the majority of users as there is a three-year guarantee against premature failure. The fittings are particularly useful for abattoirs and chemical plants as they can be hosed down without fear of water entry.

Easy installation and maintenance are important factors in all lighting systems, especially if the fittings are mounted high up in an industrial interior. In the Simplex 'Discon' device, slackening of a nut permits easy and instant disconnection of an industrial reflector, complete with lamp, from the conduit system. This attachment is now fitted to a newly introduced 'Airflow' reflector designed for a 700- or 1,000-watt MBF/U lamp. The aluminium reflector has an anodized interior and, provided with top vents, it is self-cleaned due to dust expulsion resulting from upward convection currents. From the polar curve supplied the fitting when used with a 1,000-watt mercury fluorescent lamp has a peak intensity (ATL) of 18,000 candelas, which indicates a useful illumination of about 20 lm/ft² 30 ft. directly below.

Crompton's 'sausage' shaped 'Clenelite' is an all enclosed 'Perspex' unit which accommodates one or two 80-watt fluorescent lamps complete with control gear. Designed to ensure that there are no ledges or corners for dirt accumulation, the fitting can be recommended for food and chemical factories.

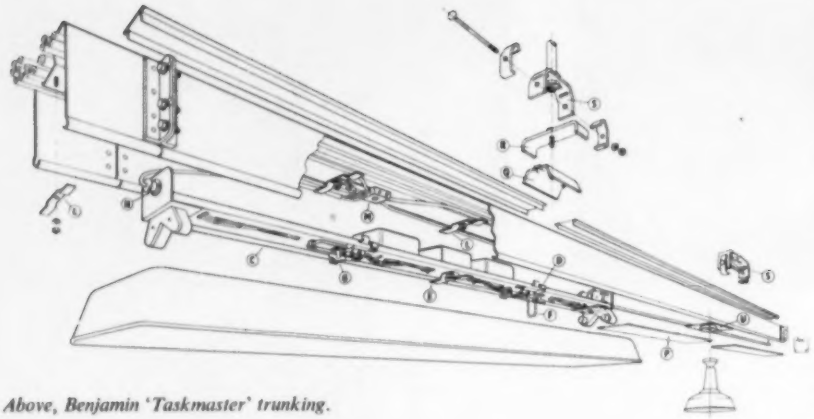
Heyes & Co Ltd, a household word in the flameproof equipment industry, have produced a circular flameproof and weather-

F. W. Thorpe's 'Thoroseal' dust free, vapour-proof fitting.

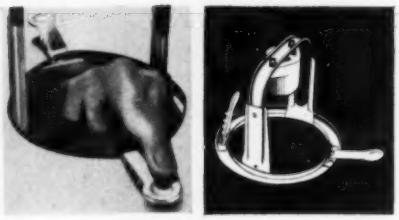
The Heyes type 1120 *circular fluorescent flame-proof and weatherproof fitting.*

proof fitting which uses a 32-watt (12-in. diameter) circular fluorescent lamp. Light control is effected by a toughened prismatic cover glass and the fitting houses control gear and terminal chamber. Undoubtedly it will be found useful, particularly where accommodation is restricted and electrical power is limited.

Screw-neck well glasses are not always looked on with favour, and Veritys offer a simple one-screw fixing which secures the glass at its base. This is a practical feature



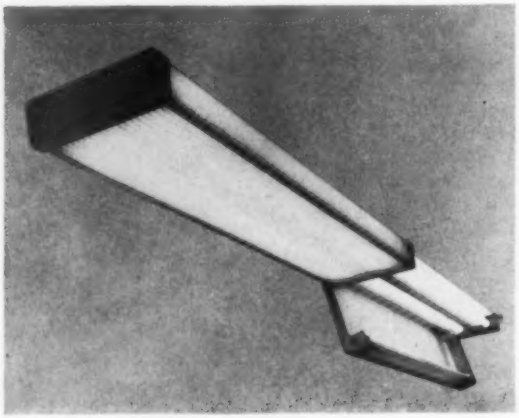
Above, Benjamin 'Taskmaster' trunking.

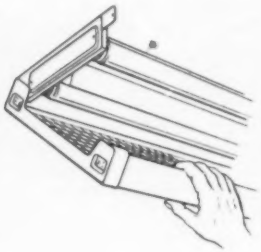


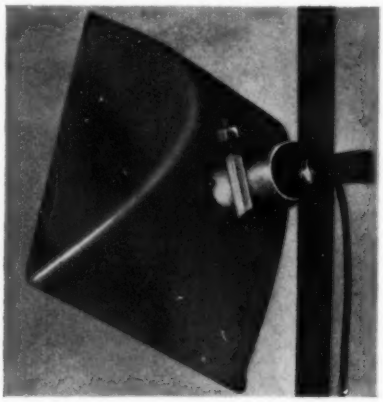
Above, the C. M. Churchouse 'Lita' anchor grip for fixing recessed fittings into the ceiling.

Below, the D.R. Illuminations weatherproof floodlight. A neoprene lampholder forms a watertight seal on the neck of the hardglass lamp; the floodlight has been used under water at depths of 100 ft.

Below, the Benjamin 'Floline' fitting showing how easily the louvre swings down for cleaning.







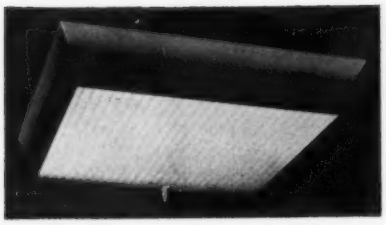
which will appeal to many maintenance engineers.

Among the new additions to industrial reflectors there is F. W. Thorpe's 'Thoroseal' which is completely dust- and vapour-proof. The toughened visor is hermetically sealed to the dispersive reflector which is detached from the cool-wiring topbody by a three-way bayonet-slot release. It is held by means of captive safety chains while relamping takes place. An innovation in industrial lighting application is Thorpe's standard dispersive reflector of glass fibre which is anti-corrosive and virtually indestructible. Two sizes are available for 200-watt and 300/500-watt tungsten lamps.

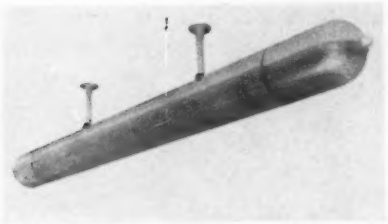
The new Benjamin 'Taskmaster' trunking is designed to meet the industrial needs of lighting equipment support and housing of various electrical service cables. At first sight the sample section appeared to be somewhat complicated in construction. Closer inspection, however, indicated the inclusion of a number of practical features, all of which will be welcomed by installation and maintenance engineers. For example, there are three separate cable ducts one of which is completely earth screened and would be ideal for carrying speech circuits.

A noticeable trend in fitting design generally is the introduction of simpler methods of reflector and diffuser removal; the conventional and frustrating methods of shade ring securing may soon be a limbo of the past. One instance of the new approach to mechanical support was seen on the stand of Troughton & Young. In just one second the diffuser, 'Perspex' or obscured glass, of a wall mounted bracket can be detached for washing or lamp replacement. Among recent introductions by Troughton & Young is a 150/200-watt general purpose opal plastic diffuser which meets the requirements of the Ministry of Education. My only criticism is that the supporting lip flange is inevitably a resting place for dust and lifeless insects.

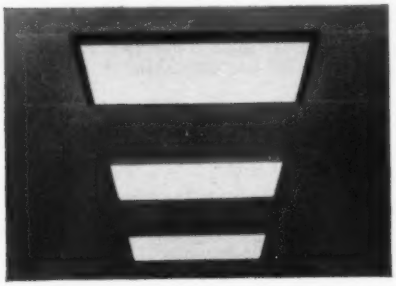
An ever popular tungsten lamp fitting is the opal glass enclosed unit which is mounted directly on low ceilings. Many attachment devices have been employed to enable the supporting metalwork to be invisible. Sometimes, for example, a small projecting arm is used to operate the sliding spider support. Corrosion or rusting often affects ease of operation of such lever mechanisms and glassware breakage may be quite high. An entirely new invisible spring-loaded mechanism demonstrated by C. M. Churchouse enables the mushroom-shaped diffuser to be attached and removed with the greatest of ease. There are protective sorbo rubber pads at the supporting points and the inner glass edge of the glass is reinforced to avoid any possibility of chipping. The firm also showed an adjustable spotlight comprising a small 75-watt mains voltage projector lamp, a louvre control ring with flat disc centre plate and a highly polished parabolic reflector. The high intensity back reflected beam will prove useful where controlled beam accent lighting is required. I was interested in seeing two types of adjustable brackets for use with internal reflector lamps. These are provided with spring clips to which are attached a range of different spinnings. Another novel introduction is a special 'Anchor Grip' ceiling recessed fitting for use with Churchouse's 'Fixolita' and 'Rotolita' spotlights. A hole of prescribed diameter is cut in the false ceiling and a circular flange supporting ring complete with the Anchor Grips is inserted in the hole. The four-toothed grips are folded back and secure themselves to the ceiling thus simplifying the process and reducing



Harris & Sheldon semi-recessed unit with 'Paragrid' tile diffusers.



Crompton 'Clenelite' fittings for single or twin 80-watt fluorescent tubes.



Revo module fittings showing variations in depth and design of dropped frames.

the time involved in fixing. An adjustable U-bracket with lampholder is fitted to the ring for use with 75-watt to 250-watt reflector lamps. Variations are also possible to enable lamps to be angled, and there are additional accessories such as perforated skirts, lense covers and egg box louvres.

You cannot please all the people all the time, and recognizing the many and varied requirements in respect of hospital bed head lighting fittings, SLR were showing a number of suggested solutions to this problem. It surely should be possible for some authority to determine the basic requirements of this type of unit, thus enabling firms to produce accordingly. Perhaps this matter will receive the attention of an appropriate BSI committee.

The economic and practical advantages of rationalization and standardization have now been recognized by the majority of firms and their general purpose fitting ranges usually include one or more series designed on the principle of basic component construction. The new Revo 'Versalite' group, which is an example of of this method of assembly, has resulted from close consultation with architects, consultants and installation engineers. One good feature, common to a number of manufacturers, is that damage in transport and storage is minimized by dispatching the fittings with wired lampholders packed in the ends of the basic channel. Holes are provided in the topbody channels permitting direct ceiling mounting or suspension via conduit or chain and knockouts are also included in each end cap to cater for surface conduit installations. It would have been advantageous however if appropriate radial slots had been provided around the central hole of the 4-ft. and 5-ft. fittings as direct ceiling fixing to existing flush conduit boxes is a very common requirement.

The detachable control gear tray of the Ekco-Ensign 'Essex' range is a good feature, particularly welcomed by the engineer now that 8-ft. fluorescent fittings are included in the series. The fused plug and socket for electrical connection is also useful in minimizing site labour charges. As there will always be a demand for fittings which do not possess all the features of a 'Rolls-Royce' design but which, nevertheless, are of good quality and moderate cost, Ekco have produced a range of 'Slim' section fluorescents. This tendency towards reduction in cross-sections was noticeable with many firms. In the Atlas 'Super Slim' series the width and height of the batten are $2\frac{9}{16}$ in. and $3\frac{1}{16}$ in. respectively. The fittings are supplied in a pack complete with lamp—an advantage for the small consumer. Trough reflectors and diffusers can be added as desired and lampholders are of spring-loaded bi-pin type.

Benjamin Electric, a pioneer industrial lighting firm, have seriously entered the commercial and decorative markets with their new fluorescent luminaires. The 'Floline' is an elegant looking unit for twin 80-watt tube operation. When ceiling mounted the total projection depth is $4\frac{1}{4}$ in. The diffuser of curved opal 'Perspex' sides and $\frac{1}{2}$-in. cube egg-box louvre base can be hinged on either side to permit easy lamp changing. For cleaning it is advisable to dip the complete diffuser in a water tray; perhaps the latter might be supplied by the firm to encourage regular maintenance by site staff. As continuous bands of light are often desirable, space couplers for ensuring perfect aligning of fittings are available.

More consideration is being given to the ease of fixing modular fluorescent fittings and a number of aesthetic variations have been introduced for creating individuality. In the Revo 'Module' range, the main body is in the form of an outer open top frame which is mechanically attached to the structural ceiling conduit supports. The reflector tray, complete with gear, is fitted to this frame and to facilitate installation it can be hinged or totally detached. As a result the fitting can be used as an access panel to the heated ceiling services. Unsightly edges of ceiling apertures can be hidden by using an overlap bezel and an interesting innovation is the dropped diffuser frame which can be supplied in 1-in., 2-in. or 3-in. depths with slit or star cut-outs.

A very close study of luminous ceiling techniques has obviously been made by Courtney Pope (Electrical) Ltd. and the variety of equipment which they can now offer is detailed in a special comprehensive catalogue. Gradual changes in background illumination are often useful in display lighting and this firm exhibited a fluorescent tube fitting, the trough reflector of which was motorized to revolve through an angle of 90°.

Simplicity of erection and flexibility of module size are two of the many advantages offered in the Ionlite 'Series 2' suspended ceiling. There is a range of suspension methods to satisfy different site conditions and the supporting beams ($1\frac{3}{8}$ in. or $1\frac{1}{16}$ in. wide) are clad in reeded, ribbed or moulded pvc in various colours. Panels, whether solid infillings, diffusers or louvres are spring held but can be easily lifted up for access purposes. If the ceiling is used with cold cathode fluorescent lamps, the firm can supply their internal reflector type.

AEI Lamp and Lighting showed the 'Isora' illuminated ceiling which comprises 40-in. square pvc films stretched over steel frames which are suspended on a framework of T-channelling. Although produced originally for natural light diffusion, the ceiling has been widely used with fluorescent tubes. Unless the lamps are closely spaced in relation to their mounting height above the panels, direct upward viewing will indicate their location by virtue of the presence of graded areas of brightness. If this occurs it should not necessarily be considered an undesirable feature, since if louvred ceilings are so viewed the actual lamps and 'works' will always be seen. In point of fact if the 'Isora' ceiling is viewed at greater angles from the vertical, a point is soon reached when the surface brightness appears to be uniform.

The new 'Circlgrid' louvre tiles by Harris & Sheldon (Electrical) Ltd offer an interesting change in ceiling pattern and an acceptable degree of visual comfort. To conform with accepted modular sizes, the unit diffuser dimensions are 2 ft. by 2 ft.

One point of which I was conscious, as I made my rounds, was a sufferance of peripheral discomfort arising from the end flicker of unshielded fluorescent lamps. Although this is a visual experience which will vary with the individual, the lamp, and the fitting, it would seem to be a matter which should receive the earnest consideration of the fittings designer. Many types of bi-pin lampholders are now available but none appears to include a slide-on opaque shield as an integral component of its construction.

The plea for greater co-operation between architects and lighting engineers has been ringing in our ears so long that, for some at any rate, it has receded into the background to come to the fore only on those too few occasions when the two parties come together at meetings of the IES or RIBA. In these two articles the authors show that successful collaboration can and does take place, and also make constructive suggestions for avoiding some of the mistakes which can arise when either of the two parties presumes to dispense with the advice and experience of the other. Both authors have first-hand knowledge of such collaboration; Grenfell Baines has not only spoken on the subject many times but has been practising what he preaches, whilst Dykes Brown is in almost daily contact with architects on lighting schemes both large and small. Lighting engineers and architects have a lot to learn about the other's job but with a little effort on both sides it is possible, as is shown in these articles, to understand the problems which each has to face and the possibilities and the limitations of what each has to offer so that the best possible lighting can be designed.

The architect and the lighting engineer

I The architect's view, by G. Grenfell Baines, FRIBA

IT is something of a platitude to say that what the architect most needs from the lighting engineer is understanding, but it is true, and until there is more of it we cannot hope for a widespread breakthrough on the front of better design. Of the will to understand there is no doubt. Engineers are willing to learn more about architectural aims and criteria, far more willing, perhaps, than are architects to help them. This must be said. For twelve years I have travelled all over the UK addressing joint meetings of engineers and architects about lighting and architecture, and in every instance but one the engineers have attended in force, while the architects have been conspicuous by their absence. Other interpretations could be put on this, but lack of interest in lighting, and in cultivating better understanding with engineers must be admitted.

Precise definitions of architecture defy one's ingenuity, but most architects will agree that *form* is a large part of architecture, and fine buildings derive much of their character from the forms arising out of the building's function and its site. When all is said and done, what a building is for, where it is, and when it was built are the only truly unique things about it, after that it is brick on brick, stick on stick, or whatever technique one cares to use.

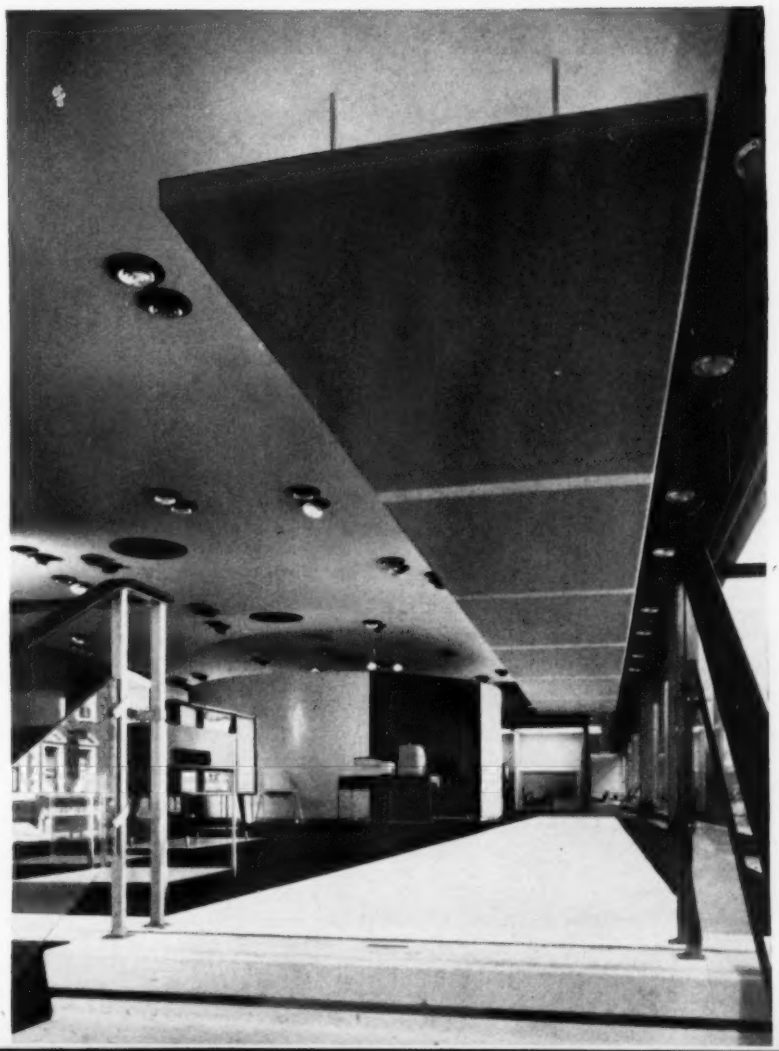
This form, or assembly of forms as many modern buildings tend to be, created by the spaces needed to serve the purpose for which the building is required, has two aspects; external, with which we are not (in this discussion) so much concerned, and which is largely a synthesis of all the diverse spaces into a relatively simple form, and internal. The internal spaces, rooms, circulation areas, places of assembly and so on, should be the main field of our joint endeavour. Each and every one possesses its own form, produced by its own dimensions of length, breadth and height; each requires designed lighting that, like every other aspect of the design, is a balanced solution to the problems of purpose, technique, economics and good looks.

To many architects, lighting as a conscious contribution to design has often been no more than the selection of some good-looking fittings spaced to fit the structural pattern, the lighting engineer only coming in to say how many there should be and what power they should have. The fact that structures are usually based on a regular grid generally ensures some regularity in spacing and some discipline in the relation between the obtruding fittings and the other elements of the room, and, as regular and adequate lighting at the working plane has been, and often still is, the engineer's main concern (he is nothing if not a functionalist), he has been more or less satisfied with conditions where regularity arose almost fortuitously, and adequacy (or inadequacy) was controlled by economics, which every engineer will tell you are always too stringent. ('The architect never allows enough money for the lighting.')

For their part, architects will complain that *clients* never allow enough for the *whole thing*, but thoughtful lighting engineers cannot be blamed for regarding wistfully, if not cynically, the expensive gimmicks in the structure or cladding of buildings.

To be constructive we want a better understanding all round, the long-term answer to which is education (with which I will deal later). The short-term problem is to improve understanding and co-operation between architects and lighting engineers now in practice. Full realization of the architectural possibilities of lighting, a realization which puts it far above the soft furnishing level, can best be created by a continued policy of propaganda. Nothing succeeds like success, and examples of successful collaboration between lighting engineers and architects are growing. One has only to compare *Light and Lighting* today with its appearance twelve years' ago. In the late 1940s, an integrated lighting scheme was still a rarity, while today practically every issue of this journal contains one or more examples of good modern buildings in which the lighting not only functions effectively, but positively contributes to the beauty of form and surface intrinsic in the architectural design.

A great part of this improvement is undoubtedly due to the striking technical advances made by lighting engineers—advances that have placed at the disposal of both professions a comprehensive range of



Above, entrance hall of Castrol House (architects, Gollins, Melvin, Ward & Partners, in association with Sir Hugh Casson and Neville Condor and Associates). A good example of clear modelling of surface and elements by controlled distribution of light. Note clear-cut junctions between walls and floor, the powerful modelling of the pillar, and the emphasis of texture on the left wall from ceiling-mounted fittings leaving space unimpaired. Right, part of the showroom at Thorn House (architects, Basil Spence & Partners; interior design, John and Sylvia Reid). Another good example of clear surface definition, combined with variety of illumination on the main ceiling surface.

Gloucester Cathedral: Left, the south transept, form revealed by light on the left pillars and shadow on the right wall. Structure revealed in the 'negative'—dark on light—emphasizing the values of variety and tonal contrast. Right, superb lighting of structure—one of the main elements of Gothic architecture. Complete freedom of space, with emphasis of high altar against dark end wall, which makes clear contact with lighter side walls clearly marking out the proportions of surface and space.

apparatus capable of introducing and controlling man-made light in such a variety of ways that there is positively no reason why every scheme should not be good. For this, architects should be, and often are, grateful, but it must be conceded that the effort required to reach this advanced technical level has permanently injured the outlook of some of the people involved. How else can one explain statements like the following contribution to a discussion on the work of the IES following the Lighting Design Data panel?

'I am a lighting engineer and proud of it. I do not pretend to be an artist, but I am a lighting engineer, and I consider that I can do a lighting installation without any knowledge of those things which apparently take up the time of the artist. There is a tendency to say that lighting is more an art than a science and thereby to suggest that that part which is a science may be sloppy. There is lighting for every kind of purpose. There is lighting for engineering, lighting for eating by, lighting for sleeping by, and they are all different, and when we submit a scheme for calculating coefficients of utilization for a general lighting system we do not mean that we are going to try to tell you how to light a restaurant to try to attract a customer. We are not concerned with the art. That part of lighting that is scientific might as well be kept scientific, and we should use proper data instead of half-baked data. I am not content to go on using half-baked data. I am going to say again that people are consoling themselves for poor engineering with the thought that they are doing an artistic job and not an engineering job.'

In case architects feel any self-satisfaction about this, let us freely admit we have our counterparts, who shy violently at a few technical terms; who cannot be bothered to keep abreast with the latest developments in light sources; and who are only too willing to leave it all to the engineer as long as the client can see his way about the place and the fittings look pretty when they are not switched on!

What the thoughtful architect wants is adequate illumination of the spaces he has created. In satisfying the functional needs, he is (within his economic limits) prepared to be advised by the engineer. But, as part of satisfying the quantitative requirements, he naturally wonders how far such factors as stimulus and comfort increase the effect of the lighting on the beholder. Here his own contribution—good proportions, interesting structural shapes, and the design of elements such as doors and windows that are attractive in themselves and make effective contributions to the bigger areas—can, he hopes, create an atmosphere that will enhance the lighting.

Then, having created a space (more often than not, in these days of stringent building economy, smaller than desirable) he wants lighting that interferes with the space as little as possible, or reacts with the space

in a sympathetic way. He wants the right bulk of the right-looking fittings in the right place and when it can be afforded, built-in lighting is frequently used for the very reason that it keeps the space free from obstructions.

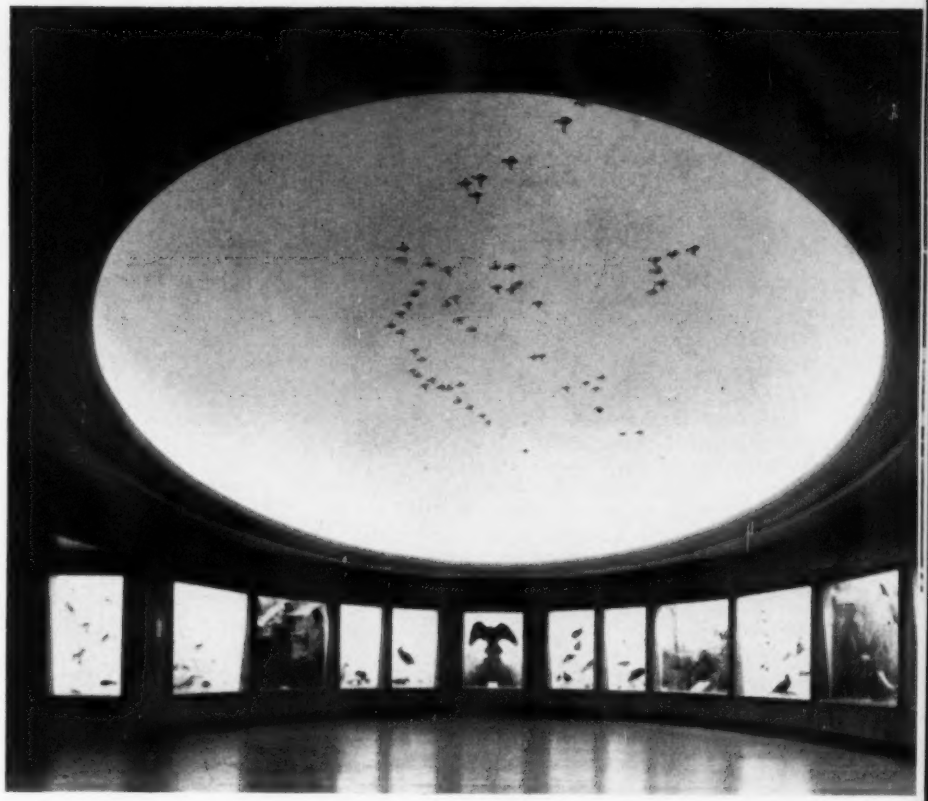
As the effects of proportion depend on seeing surfaces clearly, lighting designs that make this possible are, naturally, preferred to those which throw arbitrary patterns of light and shade. The Lighting Design Data panel obviously grasps the import of this when it says:

'The Panel is unanimous in its view that the most important feature of its proposals is that they necessitate, and rest on, this comprehensive specification of the light output ratio and the light distribution of luminaires. Without this it is futile to seek for improvement in either design data or technique, and without the co-operation of the luminaire manufacturers in making such information readily available it is equally futile to attempt to translate the achievements of research into day-to-day lighting practice.'

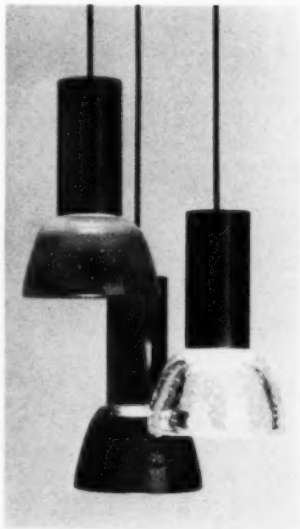
It is twelve years since I first suggested that information of this kind would help architects to develop better understanding and control of the aesthetic potentialities of artificial lighting. Paint manufacturers take the trouble to give architects data for designing colour schemes to develop further their basic forms; were lighting engineers and manufacturers to concentrate on presenting their apparatus in terms of tonal performances of known intensity and extent, architects would, just as naturally, specify desired lighting effects as they now specify colour schemes.

Along with surfaces and colours, structure can also develop the architectural content of a design. Lighting to emphasize structure can be of enormous help; conversely, fittings hanging from structural members or lighting panels that destroy all effect of load-bearing capacity, can be devastating.

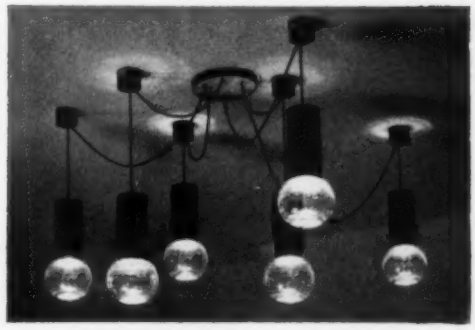
Finally, we want the young members of both our professions to develop together. Part, at least, of their studies should be joint, while practising lighting engineers should lecture in schools of architecture and the RIBA should be instrumental, through its Board of Architectural Education, in arranging courses on appreciation of architecture for student engineers. There is great awareness in the schools of architecture today of the need for architects to help both themselves and engineers in this way. While our two societies should continue to bring schools and students together, I suggest that, however disappointing the response, individual engineers should continue their good work of propaganda, remembering always that architects are only too willing to leave the ultra-scientific approach to *them*, as long as they can make the nature of lighting intelligible in terms of intensity, extent, and control.



Above, the Bird Pavilion at the Natural History Museum, showing light control sustained over a large area to produce a dramatic large-scale effect. Only modern apparatus (in this case, cold-cathode tubing) can make this possible. (Photo—Crown Copyright Reserved)



Left and below, fittings from Atlas Lighting's 'Chelsea' range. Luminaires such as these can turn the 'pollution' of space into something far more pleasant.



THE ARCHITECT AND THE LIGHTING ENGINEER

2 The lighting engineer's view

By C. Dykes Brown, MIEE, FIES

THE lighting is integral with the architecture is an expression often seen and heard in recent years. While its meaning may not be clear, the inference is that there is some co-ordination between the architecture and the arrangements for providing artificial lighting. It is likely that many who use this expression do not appreciate exactly what 'integration with architecture' implies; nevertheless they are obviously conscious of a state of affairs which is probably the outcome of co-operation between the architectural profession and that body of men known as lighting engineers, who devote most of their working time to the application of artificial light sources.

For many years the view has been expressed in technical journals and at meetings of institutions and cultural societies that architects and lighting engineers do not always work closely together. Both have on occasion criticized each other—sometimes with good reason—and the author proposes in this article to consider the relationship between the architect and the lighting engineer. Have misunderstandings occurred through their having failed to understand each others problems?

The need for the specialist

The twentieth century has brought an ever increasing need for the specialist in a wide variety of professions and occupations. Lighting engineer, lighting consultant and lighting specialist, are synonymous terms denoting a person who is interested in the use of light. Whichever way he goes about his daily work, he is, in fact, a specialist in his own right. He is qualified to advise and recommend on lighting techniques applicable to scores of different situations and is usually sufficiently interested in his subject to keep abreast of the times by making himself familiar with new developments which continue to be introduced.

As in other walks of life, some of these specialists are better than others; some have studied and practised successfully for many years, while others may have had less training and less experience. When compared with the long established architectural profession, the lighting engineers, as a recognized body of experts, are comparably new. Nevertheless, opportunities are available and every encouragement is usually given for the would-be lighting engineer to qualify for the Diploma of The Illuminating Engineering Society which permits him to use the qualification Dip. MIES. Such diplomas are awarded only to those who have successfully passed the intermediate and final examinations of the City and Guilds of London Institute in the subject of Illuminating Engineering. Further, it is necessary for them to show that they have also had five years' experience as practising lighting engineers. The architect should, therefore, be able to enlist the help of a fully qualified lighting engineer to give expert advice.

The misunderstanding

It has been said that lighting engineers are often misunderstood, underrated or ignored by architects. To what extent is this true? Is the lighting engineer or the architect at fault, or are both partly to blame? While some lighting engineers may have assisted in emphasizing the architectural beauty of an interior, there may be other occasions when they have not always done credit to themselves. Could this be one of the reasons why, at times, architects appear to have little confidence in the lighting engineer? Or, on the other hand, do the majority of architects fully appreciate that this service is available from qualified and experienced men?

An architect was once heard to say that lighting engineers are devoid of imagination when confronted with a set of drawings and, while this is generally not true, it may well be that the architect was expecting suggestions which really should have been his own responsibility. It is not always clear in which capacity the lighting engineer can be most helpful.

The architect's responsibility

Architecture and lighting—both natural or artificial—cannot be divorced from each other, and an appraisal must be made on the relationship between architect and lighting engineer. It must be conceded that the architect is the creator of the design and he must know how he expects the completed building to appear, both internally and externally. Until comparatively recently it is doubtful whether architects had much consideration for the appearance of a building when lighted artificially. In fact, the whole design was usually prepared for daylight conditions, and the modelling or light and shade that was created was the result of the positioning of the windows.

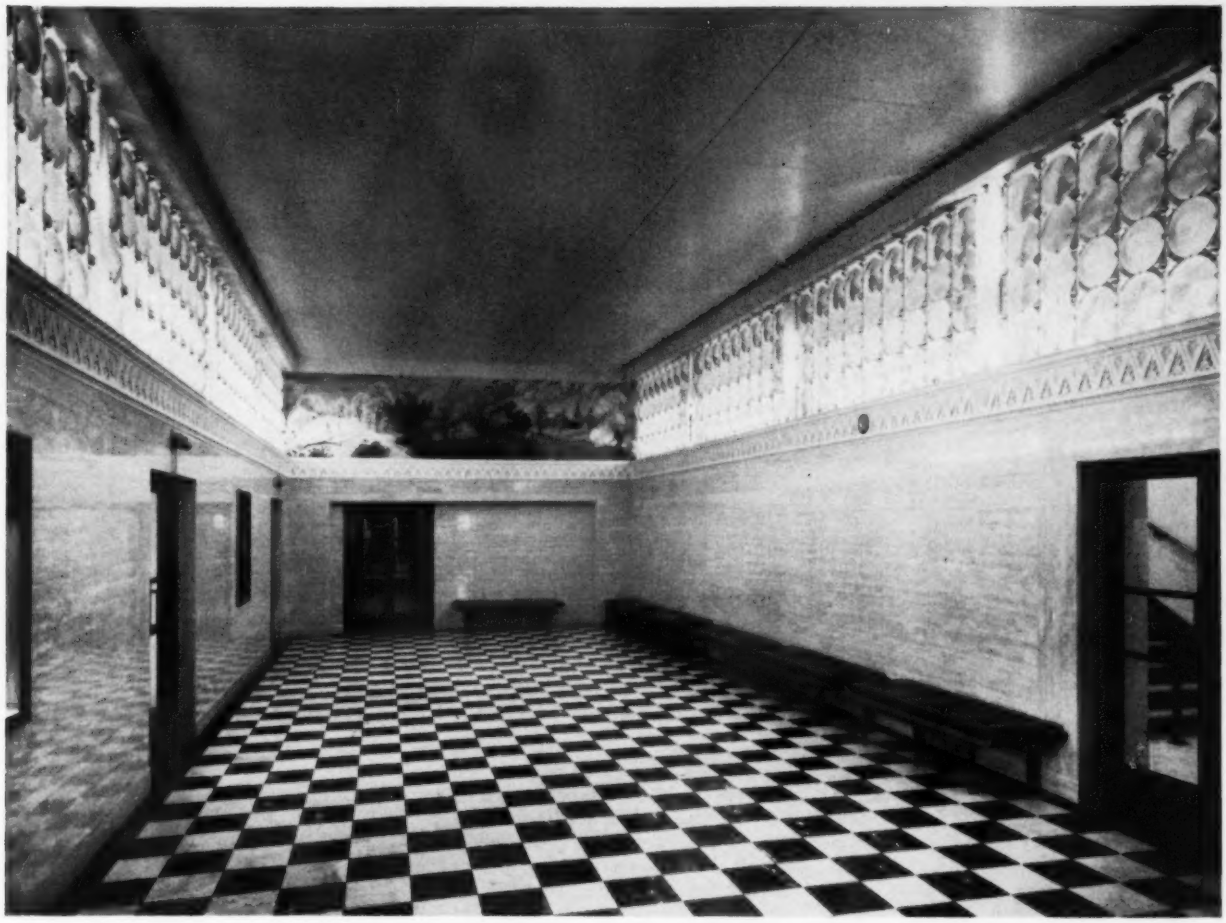
It has been recorded that 'architects have thought of the lighting equipment merely as an architectural embellishment which must look right by day, and have settled its form and position without regard for its function', which is 'to reveal suitably by night the whole of the rest of their work, which it can either make or mar.'

Although this criticism may appear somewhat severe, the experienced lighting engineer will readily call to mind many situations in which the above-quoted criticism would not overstate the case. Happily, it is more reminiscent of the past and we appear to be moving into a period of better understanding.

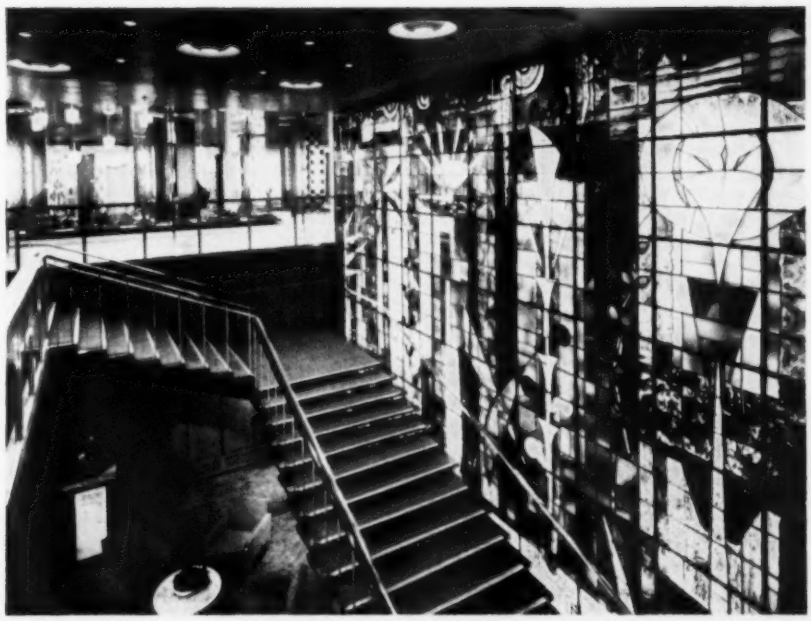
With the move towards built-in lighting in the postwar years, the tendency has been for lighting fittings in the form of 'architectural embellishments' to be less used. Even when these fittings have been used, they have often been supplemented by other (concealed) lighting equipment. With such an arrangement a large central fitting can form part of the *décor*, while the major part of the illumination is provided from concealed sources.

One cannot help wondering whether the lighting engineer pays sufficient attention to the many problems which come his way. Does he, in fact, tend to follow a stereotyped pattern of what has been done before and how often does he really make the effort to design an installation expressing new ideas?

The basic engineering training of the lighting engineer is devoted, in part, to learning how to apply light control most economically and efficiently. He is taught to calculate illumination values; to provide a system of lighting which makes possible quick and accurate seeing; and to give due consideration to the avoidance of excessive brightness contrasts. Consequently, he may become somewhat mathematical in his approach to a lighting problem, not readily



Above, discussions between architect and lighting engineer resulted in the pleasing effect of this lighting scheme in main entrance foyer at Portsmouth Guildhall. Right, this large stained glass mural and entrance hall at the new headquarters of Arthur Sanderson & Sons has been successfully lit, in spite of considerable restrictions, following early co-operation between the architect, the design consultant and the lighting engineer.



Above left, special glazing in the roof of the House of Commons Chamber designed to give the appearance of oak panelling. Above right, the same roof as seen at night.

appreciating the architect's function in decorative design. Nevertheless, many valuable contributions to the artistic use of light sources have been made by lighting engineers with either a natural appreciation of aesthetics or by skill developed through training.

Lighting engineers have for a long time pleaded with architects to allow them to explore the lighting arrangements during the early planning of the building, rather than later. Ideally, the architect should indicate what result he wishes to achieve, and the lighting engineer should suggest how this can be effected.

Progress is often the result of the almost impossible having been attempted and, at times, many a lighting engineer has thrown up his hands in despair when confronted with an architect's problem to which there appears to be no easy solution. On such occasions he must resist the first impulse to scorn an apparently absurd or frivolous suggestion, and must assume that the architect had some real reason for the proposal. Although further investigation may show that the objective is seemingly unobtainable it should be remembered that a persistent architect has on occasion finally achieved his object by insisting on further efforts to find a satisfactory solution. Even so, architects should not demand of the lighting engineer what is virtually impossible. Two examples, by way of illustration, may make this point clear.

In the first case, the architect stated that the lighting equipment should be concealed behind glass panels which, in daylight, would resemble wood in appearance. At first there was no apparent solution, and the problem became more complex when it was realized that other characteristics of the glass had to include a reasonable transmission factor, freedom from specular reflections when viewed in daylight and an acceptable colour when illuminated at night. It was only after extensive research and tests had been carried out that the problem was resolved, a special glass being produced and lighting techniques evolved which fulfilled the architect's requirements.

In the other case, an eminent architect, responsible for designing a large building in which the public was to gather, stipulated that the lighting should be installed so as to provide narrow shafts of light which would terminate abruptly some 45 ft. from the source, and then fan out to light evenly a large area beyond. He would not accept a system with the usual beam divergence to cover the area concerned. Although sincere in his request, he had, nevertheless, to be told politely but firmly that his ambition could not be realized along the lines indicated as he was attempting to defy certain well-known laws of physics.

It may sometimes be uneconomic and unreasonable to devote too much time investigating the special whim or fancy of an architect, but the lighting engineer should always consider it his responsibility to produce a satisfactory answer or give the architect very good reasons for his inability to meet his requirements.

Those who have been involved in such ventures know only too well that the cost of lighting fittings represents only a proportion of the total cost of a lighting scheme. On many occasions investigation of special problems has necessitated not only design and calculations, but also the construction of large-scale models.

A new approach to artificial lighting known as 'Designed Appearance Lighting', evolved in recent years, enables the lighting engineer to determine precisely the requirements of a lighting installation to give desired brightness patterns and modelling as indicated by the architect. This has been applied successfully to many installations, of which perhaps the best known is that at Gloucester Cathedral (see page 160).

The architect and lighting engineer must not only understand the other's language, but also the other's point of view, if ideal co-operation is to be obtained. There is little doubt that the efforts of a few architects and lighting engineers, in the last decade especially, have led to greater mutual understanding.

The IES has also been instrumental in organizing from time to time lectures and discussions for lighting engineers at which architects have described and explained some aspects of their work. Much, however, remains to be done to promote even closer co-operation and, fortunately, there is every indication that this objective will shortly be reached.

Installation of luminaires each housing two 6 ft. VHO fluorescent lamps. Each lamp has its own Alzak aluminium reflector. Note the shallow section of the luminaire. The columns are tapered concrete, circular section. This installation is at Niagara Falls, Ontario. (Powerlite Devices Ltd. photo.)

Street Lighting in Canada

By ERNEST WOTTON,
B.Sc.(Eng.), A.M.I.E.E.

Some notes on the types of lamps and lanterns used with particular reference to the climatic conditions under which they have to operate.

TO UNDERSTAND THIS BRIEF review of street lighting in Canada it is necessary to know something of the country itself. It is huge: it is bigger than the USA and 3,000 miles from coast to coast, but the population, however, is not much more than twice that of London and is concentrated in cities separated by hundreds of miles along the southern border. The range of climatic conditions is in keeping with the size of the country: for instance, in Montreal the temperature is more than 90°F. in summer and 30° or more below zero in winter, a range of at least 120°. These, and even greater extremes, have to be considered and taken into account when designing and applying street lighting equipment.

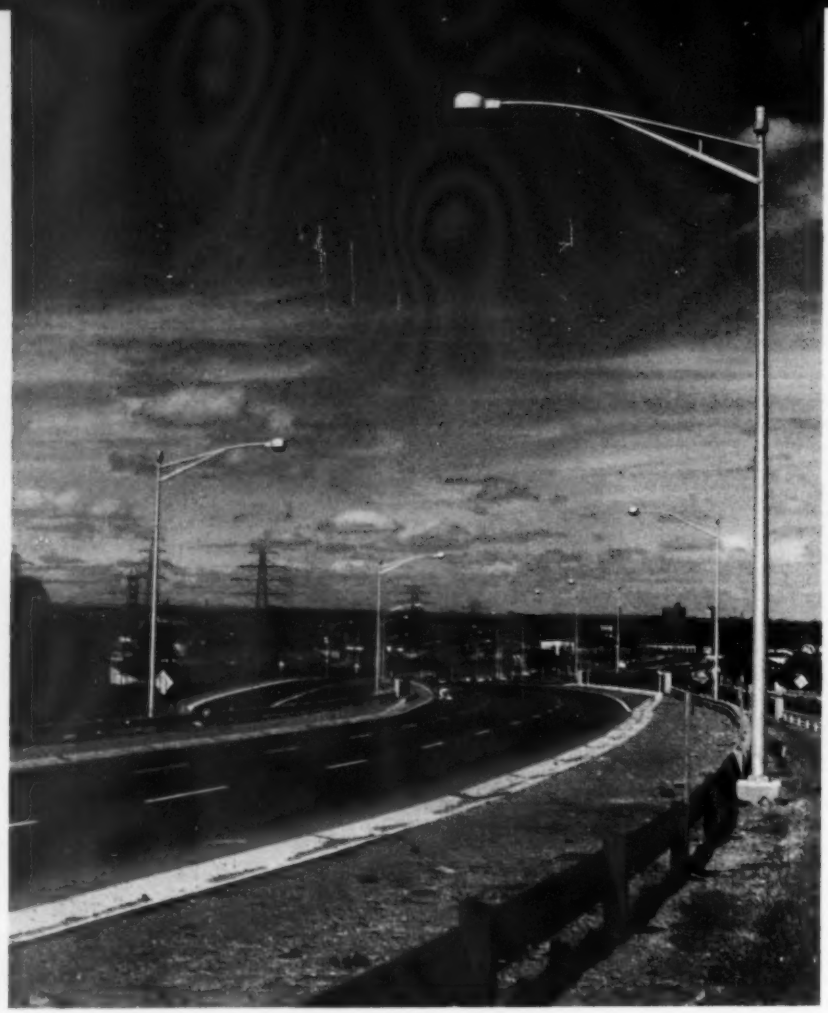
The size of the country and the climatic conditions are two of three parts of the background against which Canadian street lighting is viewed. The third part is the lighting industry in the USA which directly influences Canadian street lighting practice through Canadian subsidiaries. The user is also influenced by American advertising, most of his technical literature emanating from the USA. It is not surprising therefore that street lighting equipment made in Canada is frequently to American designs and incorporates parts made in the USA. Neither is it surprising that both the Canadian and American codes of street lighting practice very closely resemble one another. Some of the main features of the British and Canadian street lighting codes are compared in Table 1.

The emphasis on the use of average horizontal illumination and of the uniformity of illumination as design criteria means that photometric data have to include utilization curves and isophot diagrams. Considerable importance is attached to the hemisphere output ratio of the luminaire—values in excess of 0·8 are obtained for the latest mercury luminaires—and more particularly to the coefficient of utilization.

Current developments are concerned mostly with luminaires for mercury, colour corrected and fluorescent lamps. The standardized 300/500-watt 'Senior' and the 200-watt 'Junior' luminaires continue to be used almost exclusively for incandescent lighting. Sodium lighting is rarely used. More widespread use of the sodium lamp suffered early on from the fact that the Canadian lamp was designed for series burning which meant inherently a low efficiency lamp. In addition the colour of the lamp is now not generally acceptable.

With fluorescent luminaires the current trend is away from the large coffin-shaped designs in which each lamp was placed before its own reflector; the emphasis is now on reducing the size of the luminaire which must necessarily lead to a poorer distribution, particularly when the 2½-in. diameter power-groove lamp is used. It is an interesting anomaly that while the design of mercury and colour correct luminaires strains after effectiveness, this factor assumes only secondary importance in most fluorescent luminaires. Refractors are not used in fluorescent luminaires mounted normal to the road although a combination of reflector and refractor was adopted in a 'parallel to the road' luminaire introduced about a year ago. This luminaire floods the road with light while cross-louvres in the prismatic plate reduce the brightness in the main direction of view. Very little light from the luminaire falls on the footpath: most of it is concentrated on the roadway itself thus giving high utilization. Because of the orientation of the lamp parallel with the road, however, there is no concentration of beam up and down the road so that the luminaires have to be spaced comparatively close together—about three times the

* The author is with Amalgamated Electric Corporation Ltd, Toronto.



Left, a 400-watt mercury lamp installation at an intersection connecting three highways at Toronto. Note ballasts mounted on top of aluminium columns. (Powerlite Devices Ltd. photo.)

Below, closed and open views of a colour-corrected mercury lamp luminaire with enclosed ballast. (Canadian Westinghouse Co. Ltd. photo.)

mounting height—for adequate uniformity of illumination. Consequently the luminaire lends itself best to the provision of high levels of illumination.

In general modern mercury luminaires are designed around an aluminium reflector shaped like half an egg-shell into which the lamp sits and which is enclosed by a refractor bowl. The mechanical features of the luminaires are particularly well thought out with the reflector drawn in one piece and snapped into a die cast or drawn aluminium hood, with the bowl being held up by a simple latch and with good sealing of the optical system. The inclusion of these mechanical features necessitates very heavy initial tooling costs.

The practice of mounting the lamp ballast in the luminaire slip fitter (i.e. that part of the luminaire which slides over and clamps on to the bracket arm) is being increasingly adopted. This is particularly useful when the luminaire is fed, as most of them are, from an overhead supply. Attempts are also being made to design elegant luminaires—though this does not necessarily lead to elegant installations; even the best luminaire will lose its attractiveness when mounted on a wooden pole festooned with power cables.

The distribution from the mercury and colour corrected luminaires is most remarkable for the high value of the peak intensity: a 400-watt mercury luminaire may well have an initial peak of 12,000 candle power and a 400-watt colour corrected luminaire some 10,000 candle power, the appropriate figures for the 700- and 1,000-watt lamps being even higher.

The climatic conditions, to which reference has been made, impose a number of problems. The luminaire must keep out myriads of summer flies and yet must open easily under the icy winter conditions; the ballasts must operate the lamps in below zero weather (fluorescent ballasts are rated for operation to $-20°$F. and mercury ballasts to $-30°$F.); the design of fluorescent luminaires must always insure that the lamps are kept sufficiently warm or the below zero temperatures coupled with icy winds will seriously reduce the light output. The climatic conditions impose particularly interesting design problems in the case of fluorescent luminaires housing a number of highly loaded lamps. The ballasts for these lamps run comparatively hot and the designer is faced with the need of dissipating this heat from the fixture in summer and yet with the desirability of using it to warm up the luminaire in winter.

Mercury ballasts are now usually of the constant wattage type with which a variation of as much as ± 13 per cent in the supply voltage will result in a variation of only ± 1 per cent in the watts consumed by the lamp. With the exception of those mounted in the luminaire slip fitter the ballasts are encased in a cylindrical can filled with compound or encapsulated in epoxy resin and fastened to the side of the pole where they are near the supply cables. The practice of mounting the separate ballast components in an accessible enclosure in the pole base is not common as the hot and humid weather makes the enclosure very damp. To ensure reliable starting in cold weather the ballasts are designed with a high open circuit voltage; in the case of a popular 400-watt lamp this is 335 volts. Series connected street lighting has now practically disappeared in Canada; present day parallel connected ballasts are commonly supplied with taps for 115 volts and

Table 1

Comparison of main features of British and Canadian street lighting codes

Criteria	*British Code*	*Canadian Code**
Mounting height	Traffic routes 25 ft. All other roads 15 ft.	20 ft., 25 ft. or 30 ft. depending on size of lamp and light distribution from luminaire
Light distribution mainly concerned with	Defining angle of peak Limiting value of peak intensity Limiting D.I.R.	Defining angle of peak Defining lateral distribution
Lighting effect on road determined in terms of	Lumens per 100 ft. linear of road	Average horizontal footcandles Uniformity ratio

* Canadian Standard Practice for Street and Highway Lighting. (Canadian Standards Association)

Table 2

Discharge lamps used for street lighting in Canada

Lamp Dimensions (inches)	*Lamp Watts*	*Lamp Description*	*Initial Lumen (approx.)*
$48 \times 2\frac{1}{8}$	110	Power groove	6,900
$72 \times 2\frac{1}{8}$	160	Power groove	10,900
$96 \times 2\frac{1}{8}$	215	Power groove	15,000
$48 \times 1\frac{1}{2}$	100	Very high output and super high output	6,200
$72 \times 1\frac{1}{2}$	150	Very high output and super high output	9,400
$96 \times 1\frac{1}{2}$	200	Very high output and super high output	13,250
—	250	Mercury	11,000
—	250	Colour improved mercury	10,000
—	250	'Silver White' or 'White' mercury	13,000
—	400	Mercury	21,000
—	400	Colour improved mercury	20,500
—	400	'Silver White' or 'White' mercury	23,000

230 volts although systems at 275 volts and 500 volts and also at 460 volts are found.

Table 2 gives some of the discharge lamps currently used in street lighting. The powergroove, SHO and VHO lamps operate at $1\frac{1}{2}$ amps. The latter two are of conventional appearance with a diameter of $1\frac{1}{2}$ in. Their cathode assemblies however are unconventional, each cathode being placed about $1\frac{1}{2}$ in. from the end of the lamp so that the mercury vapour is cooled in the chamber behind the cathode thus keeping down the vapour pressure and keeping up the lamp efficiency. In the powergroove lamp, which is $2\frac{1}{8}$ in. in diameter, the pressure control is effected by a series of dimples along the lamp length which act as cooling areas.

Most mercury and colour corrected lamps are made in three types. The first is the standard type with a soft glass outer, and the second is a weather duty type with a hard glass outer. The third is the 'Bonus' or 'Lifeguard' lamp. This has a hard glass outer and a special quartz inner imported from Europe. The combination not only allows a life of 9,000 hours or more to be claimed for this lamp: in addition at 9,000 hours the light output is as much as 86 per cent of the output at 100 hours. This is getting on for twice that of the other two types.

When considering street lighting in Canada it should be appreciated that practice is complicated by the requirement to use dipped headlamps for driving in towns, a practice which is distracting to oncoming drivers. It must also be appreciated that, with a few minor exceptions, each Canadian municipality is responsible for the street lighting within its own boundaries. The larger municipalities install and maintain their own street lighting but in the smaller towns this work is undertaken by the local supply authority which then rents the installation to the municipality. Outside the towns the street lighting is the responsibility of each Provincial Department of Highways. There is no authority comparable with the Ministry of Transport and able to influence the amount and quality of street lighting carried out. Each authority sets its own practice which may well differ from that of neighbouring authorities. All this inherently means a variety of different approaches making it difficult to discern country-wide trends.

As a result of the distances met in Canada street lighting is usually confined to the centres of population. There is no general practice of lighting a traffic route connecting one city with the next: lighting on such routes is restricted to intersections and other critical points. Where the road crosses railway tracks the need for caution is emphasized by a yellow light for which either sodium lamps or colour corrected lamps with a special yellow lacquer coating are used. Of the two sources the sodium gives a much more effective yellow, the other type appearing rather green and washed out by comparison.

The power supply, even in cities, has been and is still sometimes run overhead from wooden poles. These poles also carry the street lighting luminaires the siting of which must necessarily take second place to the need of supporting the cables. Consequently many installations are made with luminaires on only one side of the street. It is, however, pleasing to see that in newer city installations the supply has been put underground. In such cases the luminaire is frequently supported from either a very plain spun concrete column with a bracket attached separately or from a more elegant tapered aluminium column. Because of the emphasis on a high coefficient of utilization the bracket overhang is frequently much greater than is customary in Great Britain to ensure that as much light as possible gets on to the road surface itself.

In cities which renewed their street lighting immediately after the last war, it is not surprising that the use of incandescent lighting predominates. This type of lighting is still being installed in residential areas though most main roads in cities are now illuminated by either fluorescent, mercury or colour improved sources. The choice of light source is sometimes determined by climatic conditions. In the west, for instance, where the climate is particularly severe, the mercury and colour improved sources predominate; where there are no overriding conditions local preference decides what is used.

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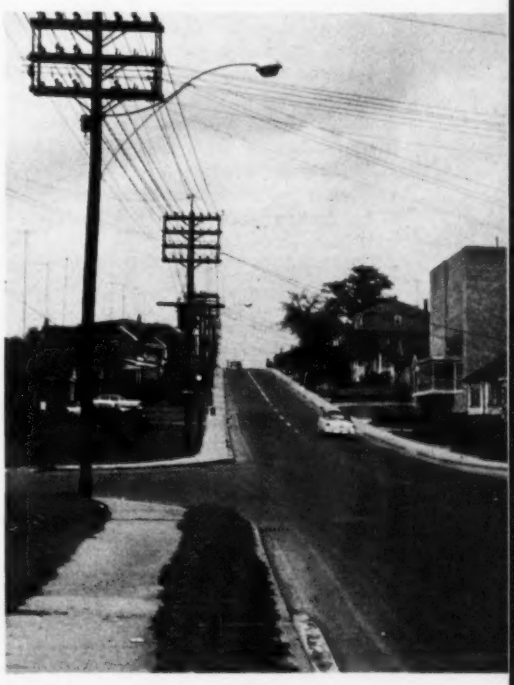

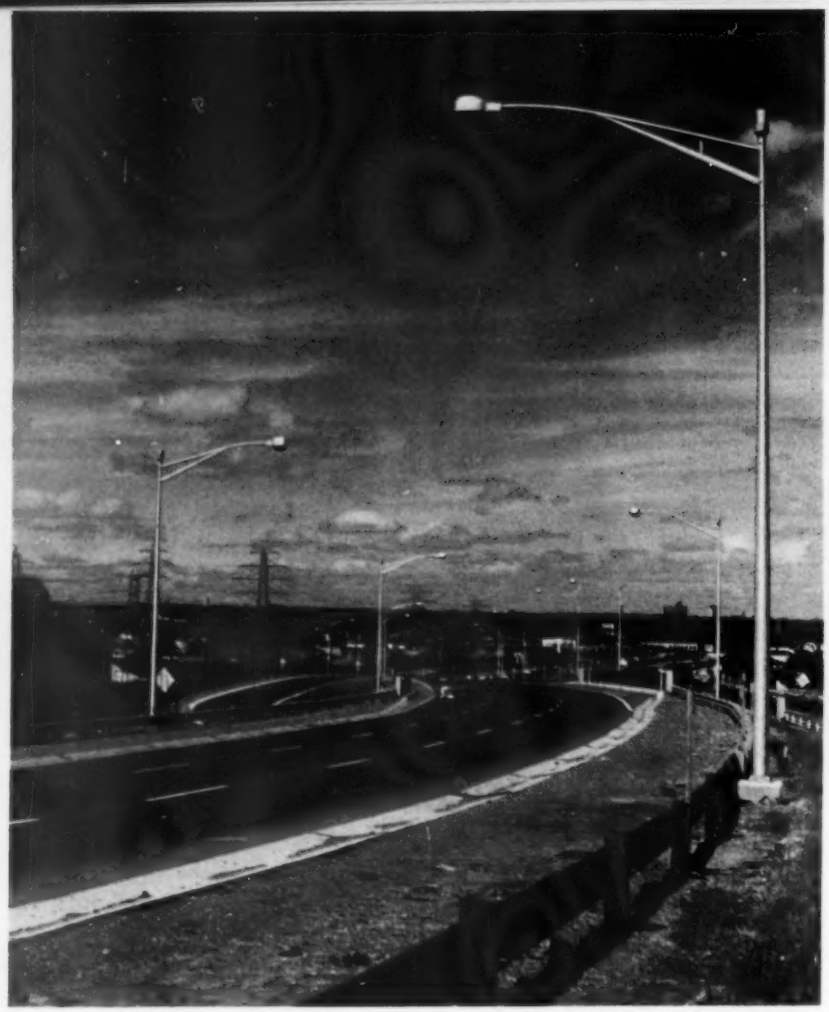

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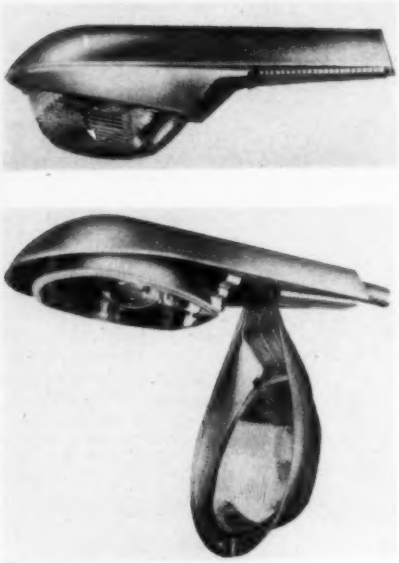

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G.E.C. post top lanterns

give Birmingham's Inner Ring Road a new high standard of illumination

Lighting-up time in Birmingham will see a new standard of after dark safety on the city's 3¾ mile long 110 ft. wide dual carriageway ring road, already partly constructed.

An overall light intensity of at least 30,000 lumens was specified for the new road, this from lanterns spaced at 100 ft. intervals on the outer kerbs. To achieve this, Sir Herbert J. Manzoni, C.B.E., the City Engineer and Surveyor, called in the G.E.C. Lighting Division to develop his design for a new type of post-top lantern housing three 400w colour corrected mercury lamps.

This is the kind of combined operation the G.E.C. Lighting Division welcomes. It challenges its experience, advances still further its knowledge and makes another British road safe after lighting-up time.

The specially designed post-top lanterns are 4 ft. 6 ins. in diameter, approximately 18 ins. deep, and consist of a domed canopy and dished translucent Perspex bowl. Access to the three Osram 400w colour corrected mercury lamps is remarkably simple. The 30 ft. high slender steel poles are made by Stewarts & Lloyds.

G.E.C.
LIGHTING DIVISION

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

A new rotary pump used in making mercury lamps. It can handle twenty-four lamps at a time; a special metering device automatically controls the amount of mercury introduced.

Development and Production of Discharge Lamps

New processes now being brought into use at the G.E.C. Lamp Works at Shaw

BASIC RESEARCH on discharge lamps is carried out by the General Electric Co. Ltd. in their Research Laboratories at Wembley. Translating the results of this basic research into practical lamp designs suitable for quantity production creates a number of problems and some four years ago the GEC decided to locate its main Discharge Lamp Development Laboratory with its principal discharge lamp factory at Shaw in order to reduce the time lag between conceiving an idea and introducing it to the consumer as a new product.

Important contributions have been made by the Laboratory in fluorescent tube manufacture. They include a classification or sorting process to select the range of phosphor particle sizes giving highest tube efficiencies. Specialized techniques have been established, using water soluble binders, which have simplified the coating process by which the phosphors are applied to the tube wall. Among present problems being investigated by the Laboratory is the redesign of tube cathodes to give better performance under vibration, often encountered in transport lighting. Many cathodes today show resonances around 90 cycles—a frequency met in aircraft and trains. Work on the new cathode design—which has no major resonances below 200 cycles—is well advanced.

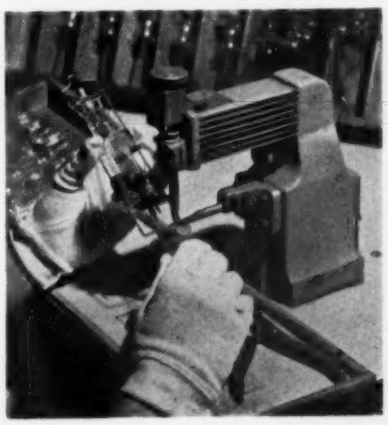
The development of high wattage sodium lamps has been an important part of the Development Laboratory's work during the past two years. Typical of the new high power lamps is the 280-watt integral type, marketed just over a year ago. Since then design improvements have increased its efficiency by some 30 per cent without reducing its long life. The linear type of lamp has a luminous efficiency of 100 lumens per watt, but since the theoretical maximum efficiency for sodium light is 400 lumens per watt, there is obviously much work still to be done on this source. A reflector sodium lamp has been introduced to help meet the demand for more compact lamps and lanterns. Today's greater demand for sodium lamps means that the time has come for making them on automatic machinery. Previously, they have been made by trained hand operators to a high degree of uniformity and with quality inspection at every stage. Now a new series of techniques for automatic manufacture has been evolved by the Development Laboratory.

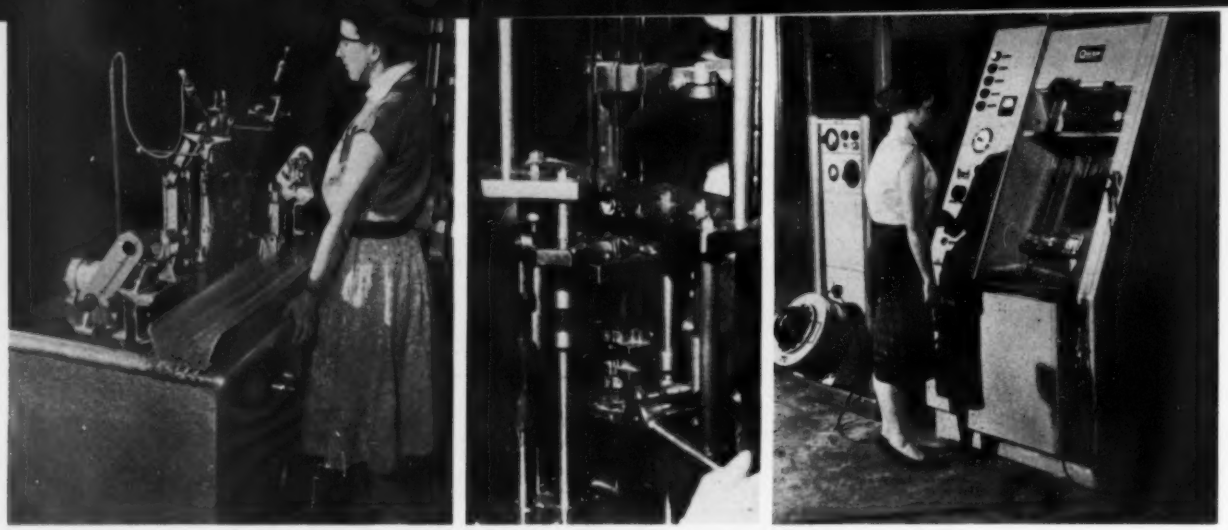
The mercury vapour discharge lamp has approached its theoretical maximum efficiency more closely than the other discharge lamps and future development is likely to be concentrated on further colour correction. A considerable growth in the demand for these lamps has made possible the development of mechanized manufacturing processes at Shaw. In the MB type of lamp, transparent silica is used to make the main high pressure arc tube. This substance can only be worked at temperatures well above 2,000°C. Mechanized manufacture therefore involves a number of highly specialized operations and techniques, which were developed about three years ago. Most recent of the mercury lamp developments is a pumping process using an automatic rotary machine, the only one in Europe which performs the whole operation.

Another job for the Laboratory is the manufacture of highly specialized light sources for spectroscopic work, the most important example being lamps containing the 198 isotope of mercury. This isotope costs £5m per lb. It has to be split into quarter-milligram quantities without being contaminated to provide a light source for high resolution interferometry. By using these new lamps the standard metre can be measured in terms of the wavelength of one of the colours emitted by the lamp.

Recently, there have been two important developments in the production of Osram fluorescent tubes—a particle size grading of phosphors and a new coating process. The first takes place in the phosphor processing room where phosphors are classified on the cyclone principle. The classification

Spot welding the framework which supports the arc tube in mercury lamps.





Left, an automatic machine which bends glass tubing for the inner arc tubes of sodium lamps. Centre, stemming jig for sealing the exhausting and filling tube on to the inner tube in sodium lamps. Right, automatic pumping and filling equipment for sodium lamps.

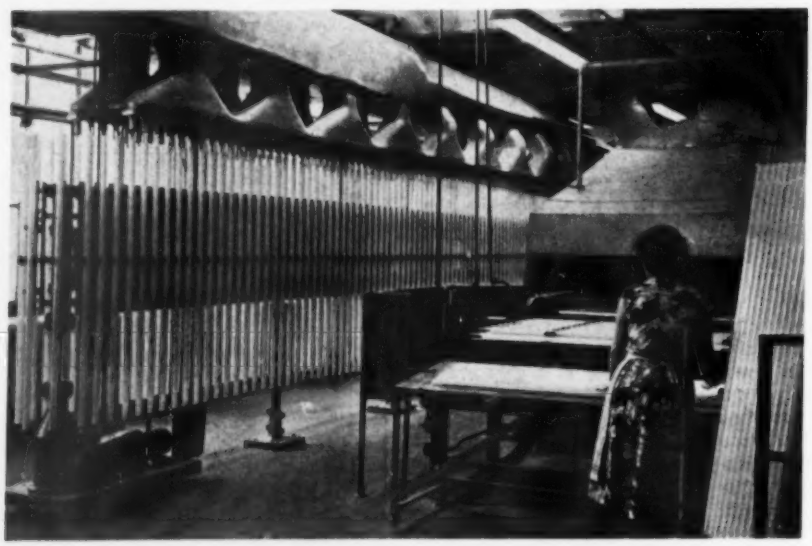
process has been introduced because it was found that the ultra fine particles of phosphor, produced during milling, lowered tube efficiencies by about 10 per cent. At the top, the cyclone units are cylindrical in shape, tapering to a small hole at the lower end. The milled powder, suspended in water, is pumped under pressure through a side tube in the top part of the cyclone. A swirling action is set up, the heavier particles being thrown outwards to drain down and pass out of the lower orifice. The lighter particles, which remain near the centre, are caught in the rising stream of the vortex and carried out through a centrally-mounted, vertical tube in the top of the cyclone called the 'vortex finder'.

Classification is carried out in two stages. In the first, particles larger than 20 microns drain away and are returned for remilling. Particles less than 20 microns are carried over to be classified in the second unit. Those in the size range 2–20 microns drain away and are used for tube manufacture, the ultra fine particles carried out of the vortex finder tube being discarded.

Previously, the powder was dry-milled and binders with organic solvents were used to make the phosphor suspension for coating the tubes. The new process, in which the powder for tube manufacture is suspended in water, makes the use of a water soluble binder almost essential. It would otherwise be necessary to dry the powder and this would result in undesirable caking. The employment of water soluble binders is aking to present day emulsion paint manufacturing techniques, and has a number of incidental advantages. Special fire precautions and special ventilation to remove fumes are no longer needed. Water soluble binders also enable better coatings to be achieved with the larger particles. The introduction of these binders raised a drying problem and this has been solved by installing a conveyor system. The conveyor is now being used full time for 5 ft. and 4 ft. tubes. Placed vertically on the conveyor, the tubes are dried by puffs of warm air as they pause in their movement along the rail. On their return, they are put through the oven for the final baking process.

Plant is now being assembled at Shaw for a mechanized group to make sodium lamps. The main features so far are the mechanical U-bending machine; conveyor belt annealers for removing the strain from the glass; and automatic bench pumps. The U-bending machine performs work it would take four to six months to train a glass worker to do. Furthermore, it equals the output of three or four such operators. Only two operators are needed to work five of the automatic bench pumps which will have an output equal to that of twelve operators at present. After the pumps have been loaded, the operators will start the cycle of operations by merely pressing a button. At present, a long, complicated sequence of processes has to be remembered and it takes up to 90 minutes to pump the lamps.

An automatic unit for drying the inner phosphor coating on fluorescent tubes. Designed for the new water-soluble binders it operates on the conveyor principle and uses puffs of hot air for drying.



A new machine for sealing the inner assemblies of integral sodium lamps to their outer jackets has also been developed and is undergoing trials. The almost perfect vacuum, required in the outer jacket for maximum output, is achieved by firing a barium getter in the jacket at a predetermined stage in the pumping schedule. The getter is fired by a time-controlled, eddy current heating set and absorbs residual traces of gas lingering in the jacket.

Recent innovations in mercury lamp production are quartz pinching machines and a rotary pump. The factory is now equipped with eight of the latest type of quartz pinching machine, used to pinch or seal-in the electrodes. The speed of operation varies with the type of lamp being made, but the average figure is 30 per hour. A rotary pump for low wattages has been developed and is at present undergoing production trials. Previously, all lamps were exhausted on 'bench pumps'.

LIGHTING ABSTRACTS

OPTICS AND PHOTOMETRY

838. Practical guide to colorimetry. 535.65
Illum. Engng., **55**, 109-113 (*Feb.*, 1960).

Prepared by a Colorimetry Sub-Committee of the American IES, this Guide first differentiates between two aspects of the colour performance of a lamp, viz.: colour rendering and colour appearance. Only colour appearance is dealt with in this Guide, the Barnes photoelectric colorimeter, a brief description of which is given, being advocated for its numerical evaluation. Other aspects of colorimetry dealt with include the derivation of colour temperatures from CIE chromaticity co-ordinates, and various aspects of colour matching by visual judgments. P. P.

621.383

839. Calibration and re-calibration of photoelectric meters to correct for the spectral characteristics of the measured light.
L. Levi, *Illum. Engng.*, **55**, 99-100 (*Feb.*, 1960).

Where a photoelectric photometer is not colour-compensated to the CIE 'average eye' response, a correction must be made to readings obtained from the photometer when it is used to measure an illuminant of spectral composition different from that used to calibrate the photometer. The correction factor can be determined from an integration with respect to wavelength of the relative responses of the CIE standard observer and of the photometer and the relative spectral distributions of the calibration illuminant and of the illuminant to be measured. P. P.

840. The nature of light. 535
Sir Lawrence Bragg, *Trans. Illum. Engng. Soc.* (*London*), **25**, 6-10 (No. 1, 1960).

The alternating acceptance of the corpuscular and wave theories of light since the beginning of the seventeenth century is reviewed by references to the work of the principal investigators during that period. Newton's eminence during the seventeenth century tended to inhibit advances during the following century, and so his corpuscular theory remained virtually unchallenged until Thomas Young, supported by Fresnel, proposed an acceptable wave theory in the early nineteenth century. Then, at the beginning of the twentieth century, Planck's quantum theory, supported by Einstein's work, brought the corpuscular theory back into favour again. Whether light is considered as waves or as particles is, in terms of present-day knowledge, a 'matter of tense'. Before the light is observed it must be treated as waves; when it has been observed then it is recorded as particles. P. P.

841. Measurements on exposure meters. 771.376.35
J. Krochmann, *Lichttechnik*, **12**, 203-207 (*April*, 1960). *In German.*

A large number of exposure meters of different types, supplied by eight different makers, were examined to find out how their characteristics varied. In particular the effect of obliquity of the incident light was compared with that in an 'ideal' meter, i.e. one whose response imitates the effect of the light on a 35 mm. film in a camera with a lens of 50 mm. focal length, where the acceptance angle is 47°. The acceptance angles found for the various meters ranged from 18° to 46°. The relation between indication and object luminance, and the effect of colour of the light were examined and the fatigue of the photocell was measured. The value of exposure indicated should vary as the logarithm of the object luminance and the base of the logs should lie between 1·94 and 2·08. In fact the values found ranged from 1·71 to 2·24. It was observed that the nature of the light could be ignored, except as regards sodium and HPMV lamps. J. W. T. W.

LAMPS AND FITTINGS

621.327.534

842. A constant-wattage ballast for two or more mercury lamps.
V. W. Olson, *Illum. Engng.*, **55**, 79-82 (*Feb.*, 1960).

Operation of two mercury vapour lamps from the same pole or support, as in the centre of a dual carriageway, has, until recently, required duplicate control gear or conventional two-lamp ballasts with provision for variable supply voltage tappings. Recently developed two-lamp constant wattage ballasts avoid the necessity for the supply tappings, and at the same time enable one lamp to burn with the other extinguished. Multi-lamp ballasts (up to 12 lamps) have been considered, and have the advantage of stable operation and little loss of light output with up to half the lamps extinguished. P. P.

843. The generation of light. 621.32
L. J. Davies, *Trans. Illum. Engng. Soc.* (*London*), **25**, 11-20 (No. 1, 1960).

The three basic processes whereby light is generated, i.e. incandescence, gaseous luminescence and solid luminescence, are separately dealt with, particular attention being given to progress made since the inception of the basic process and to recent developments and their background of research. The silica infra-red lamp provides a source of extremely high temperature, the 'iodine cycle' considerably improves lumen maintenance and the fused silica lamp holds hope for very high luminous efficiencies. The 100 lm/w sodium lamp and the xenon high pressure lamp have both found immediate uses. One particular application of solid luminescence is in electroluminescent high-speed counters. Fluorescent lamps of high loading and consequent increased light output are now available. In all these developments, the electronic computor has become an important research tool of the lamp engineer. P. P.

844. Lamps and lighting. 621.32.628.9
Elektrizitätsverwertung, **35**, 1-67 (*Jan.-Feb.*, 1960). *In French or German with English summary.*

This issue of the above journal, published in Switzerland by the Union Internationale des Producteurs et Distributeurs d'Energie Electrique, is specially devoted to lighting and contains a number of useful articles by different authors. 'High pressure mercury vapour lamps and their control gear' by K. H. Bodenhausen describes resistive and inductive ballasts and their characteristics. 'Control of temperature of fluorescent lamps with heavy loading' by H.-J. Arlt and H. Kümmritz describes grooved lamps with a loading of 80-90 W per metre; other lamps of this type and their operation are dealt with in a paper 'High power fluorescent lamps' by H. J. J. van Boort. An investigation of the life of fluorescent lamps and starters is described by F. Knobel in a paper 'Electric light sources and their accessories.'

Papers on 'Present practice in street lighting in the German Federal Republic' by W. Schmidt and on 'Road lighting installations and traffic safety' by R. Walthert are followed by a series of short articles describing lighting installations of special interest, including the recent light and sound spectacle at Geneva. There is also a paper by C. H. Herbst on 'Sources of error in the measurement of light values.' J. W. T. W.

LIGHTING

628.972

845. Museum lighting. The Solomon R. Guggenheim Museum and the Abbey Aldrich Rockefeller Folk Art Collection.
A. A. Binder and L. S. Harrison, *Illum. Engng.*, **55**, 58-64 and 65-70 (*Feb.*, 1960).

The first article describes the way in which the curator of the Guggenheim Museum in New York has revised Frank Lloyd Wright's concepts for the lighting of this museum, replacing natural daylight as the dominant illuminant by fluorescent light matched to day light by means of a combination of 'cool white' and 'warm white' lamps. The second article describes the techniques specially developed for lighting the American folk art exhibits in a new museum at Williamsburg, Virginia, where it was desired to create an early nineteenth-century atmosphere, and where therefore the anachronism of modern lighting fittings had to be avoided as far as possible. P. P.

846. Illumination levels and visual performance.
G. Hassel, *Ljuskultur*, **30**, 27-33, No. 1 (*Jan.-March*) 1960. *In Swedish.*

A survey of the experiments of Weston and of Blackwell, with a particularly detailed study of the latter. The weakness of the Blackwell concept of 'field factor' is pointed out. The direct interpretation of the Blackwell data in the form of lighting codes results in a very wide range of recommended illumination levels. This range has been considerably compressed in the new American tables of recommended illumination. R. G. H.

MISCELLANY

Correspondence

Illumination levels and daylight factors

SIR,—Discussions at the conference of the C.I.E. (International Commission on Illumination) in Brussels, 1959, and elsewhere, have shown that recommended levels of illumination for specific visual tasks will be higher when revised Codes of Practice in different countries are completed. These higher levels arise out of new analyses of visual efficiency, and they are such that it will not be possible to attain them by daylight from side windows alone under normal circumstances except in quite shallow rooms. Even with roof lighting they may only be attained by very large amounts of roof glazing which will give rise to excessive internal heat loss. The minimum 'amenity level' at present being discussed in Great Britain, for example, is 15 lm/ft², which demands a minimum daylight factor of 3 per cent on the usual basis of a 500 lm/ft² sky.

It will be recalled that the conversion of recommended illumination levels to daylight factors through the 500 lm/ft² sky came about through the physical fact that the mean illumination produced by an average overcast or cloudy sky during the working day throughout the year is of this order. Brighter skies occur during great parts of the year, up to a maximum which gives an illumination of the order of 3,000 lm/ft². Conversion from illumination levels to daylight factors could be made through any other value of sky up to this maximum, but would not have the same basic significance as the value of 500 lm/ft². The choice of some arbitrary value for conversion, such as a sky of 1,000 lm/ft², which has sometimes been suggested, cannot therefore be recommended.

Fundamentally there is some argument against any conversion of this kind. The optimum size, shape, and position of a window in a room is a function not only of the level of daylight illumination produced on the working plane, but is at least as much a function of the adaptation conditions so produced and of the degree of freedom from excessive sky glare, apart from such aesthetic considerations of proportion, etc., or of non-visual factors such as the avoidance of excessive internal heat loss or of excessive solar heat gain. It would be more logical to determine fenestration from a proper study of all these basic principles, and then, if the level of daylight so produced is less than that demanded for the proper performance of the visual tasks, to integrate with the daylight the necessary amount of permanent supplementary artificial lighting, designed as part of the building from consideration of adaptation and brightness balance.

Clearly the practice of lighting has now reached a stage where urgent thought must be given to the situation which has arisen. The need for greater working efficiency has led to demands for higher levels of light, and for freedom from glare, which cannot always both together be supplied by daylight alone. If these demands are recognized as valid, it is better, and indeed it may be proved to be more economical, to meet them by combined day and artificial light. The levels of daylight factor at present recommended in Codes of Practice are in many instances of the right order to give the best compromise between the various conflicting factors, e.g. level of illumination, sky glare, favourable adaptation conditions, internal heat loss, and solar heat gain. In some cases (for example, schools and hospitals) this is the result of careful and deliberate thought, in others it has happened by trial and error. It would seem possible that the present recommended values of daylight factor would in many cases not have to be greatly altered and it may therefore be wise to leave them as they are for the present. Eventually, however, as new knowledge is gained, they should be examined and confirmed or amended on the basis of all the relevant factors, and not only on the basis of working level of illumination.

At the same time recommendations should be considered for the realization in practice of those lighting levels which are necessary for efficient visual work, in terms of combined daylight and artificial light. This is an entirely new approach for a lighting Code of Practice, but it is one which seems essential in view of current trends in lighting.

Building Research Station, Watford R. G. HOPKINSON

Education

SIR,—Your readers may have been misled by the remarks in Notes and News of your May issue about 'plans for a full course on illumination' at Nottingham University.

This course is an optional one for final-year students in electrical engineering, and follows similar lines to the course introduced by Professor Cotton in 1950. The students selecting this option will be studying, at the same time, two other main electrical subjects. The title 'full course' thus appears to be rather an overstatement. Facilities will exist however for postgraduate research in illumination: in fact some work on subjective aspects of lighting is starting immediately. It is this particular branch of the subject which is forming an interesting bridge between electrical engineering and the hitherto unconnected university disciplines of psychology and physiology.

It is hoped that the co-operation of the lighting industry, already gained as a result of our embryonic research school, will be strengthened even further as a result of the eventual production of some engineering graduates with a knowledge of light and lighting.

A. M. MARSDEN

University of Nottingham

Situations

Vacant

LIGHTING DESIGN. ASSISTANT required for Lighting Design Drawing Office. He should have some experience in the preparation of lighting schemes, and have passed the Intermediate City and Guilds Examination in Illuminating Engineering. This is a pensionable post with progressive conditions of employment. Please write with all details to the Employment Officer, Philips Electrical Limited, Century House, Shaftesbury Avenue, London, W.C.2, quoting reference 427.

DESIGNER DRAUGHTSMAN for Electric Lighting Fittings. London area. Good prospects. 5-day week. Apply, stating age, experience and salary required to Box No. 709.

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Lighting Fittings Design — versatile DESIGNER/DRAUGHTSMAN with practical knowledge of manufacturing technique required for drawing office in Central London. Diverse range of industrial, commercial and specialized equipment. Usual large companies benefits. Reply Box No. 712.

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Wanted

COMMERCIAL ARTIST/LIGHTING EXPERT (29) with experience in Advertising Agency and printers' work; as Sales Engineer for a major lighting firm; now Advertising Manager for light-fittings manufacturer seeks similar post. Box No. 710.

Trade Literature

AEI LAMP AND LIGHTING CO LTD, Melton Road, Leicester. Illustrated Mazda lamp catalogue including price list. It is divided into three main parts the first of which covers general lighting, tungsten filament, service and neon lamps; the second fluorescent lamps; and the third electric discharge lamps.

COURTNEY, POPE (ELECTRICAL) LTD, Amhurst Park Works, Tottenham, London, N15. Colourful brochure illustrating decorative pendant and ceiling fittings and wall brackets. Also included are the 'Vistalite' range of fluorescent fittings and the plastic lighting panels.

EKCO-ENSIGN ELECTRICAL LTD, 45 Essex Street, Strand, London, WC2. Leaflet on the 'mushroom' lamps.

HOLOPHANE LTD. Elverton Street, Vincent Square, London, SW1. Catalogue 5600 giving full details of the compnay's industrial lighting fittings including details of a new range of translucent and covered fittings for heavy duty high bay applications, reflector-bowl cast pendants for wider range of lamps and new weatherproof flameproof fittings.

PHILIPS ELECTRICAL LTD, Century House, Shaftesbury Avenue, London, WC2. New broadsheet giving full details and prices of bi-pin fluorescent fittings, polyeter-filled ballasts and rotor type lampholders.

ROTAFLEX (GREAT BRITAIN) LTD, 4-10 Nile Street, London, N1. A leaflet giving details of two new school shades designed by John and Sylvia Reid with the co-operation of the Ministry of Education. Also a leaflet describing four styles of magnetic lamps for commercial and office use.

Obituary

William Archibald Garnet Barrett

It is with deep regret that we record the death of Mr W. A. G. Barrett, Sales Director of Gowshall Ltd, on 24th April after a long illness. Mr Barrett joined Gowshall Ltd in 1938 and was appointed Sales Director in 1946.

Personal

MR W. J. WALPOLE has been appointed managing director of Lumenated Ceilings Ltd. He has been with the company since it was formed in 1954 and has been a director of the company since January, 1958.

Stella Lamp Co Ltd announce the appointment of MR J. M. ANDERSON as their sales agent for Scotland and Northern Ireland as from 1st April. Mr Anderson was until recently Regional Manager in Scotland and Northern Ireland for the AEI Lamp and Lighting Co Ltd.

MR N. W. WILKINSON has recently taken up an appointment with Nettle Accessories Ltd to be responsible for the further development of their Industrial Division.

Industrial Notes

DURING THE REVISION OF BS1332, 'Guide to civil land aerodrome lighting', it became apparent that detailed standards were necessary for some of the special fittings and equipment used in civil land aerodrome lighting installations. BS3224 'High-intensity elevated runway lighting fittings' is one of a series specifying requirements for the form and performance of such fittings. It applies to fittings used for lighting runways at civil land aerodromes, suitable for use on systems with a voltage not exceeding 50 volts r.m.s. to earth. The standards pecifies photometric performance and essential mechanical and electrical features (excluding lamps). 'BS3224' is one of four marks which are required to appear on the fittings. Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Price 4/-.

IN THE INTERNATIONAL REVIEW of 1959 which appeared in our April issue, a picture was included of the Auckland Harbour bridge. We have since been given to understand that the lighting of the bridge was by equipment supplied by the GEC Ltd.

PHILIPS COLOUR 34 FLUORESCENT LAMPS, previously obtainable only in limited quantities in this country, are to be made more generally available. In wide use on the Continent for a number of years under the name of White Deluxe 34, these lamps differ from the ordinary fluorescent types in that they have two layers of phosphor coating instead of the usual single layer. The extra coating absorbs any residual mercury light from the discharge, and converts it into additional red light, in which normal fluorescent lamps are somewhat deficient. Colour 34 is similar in colour appearance to the well-known 'Natural', but its colour rendering is much improved.

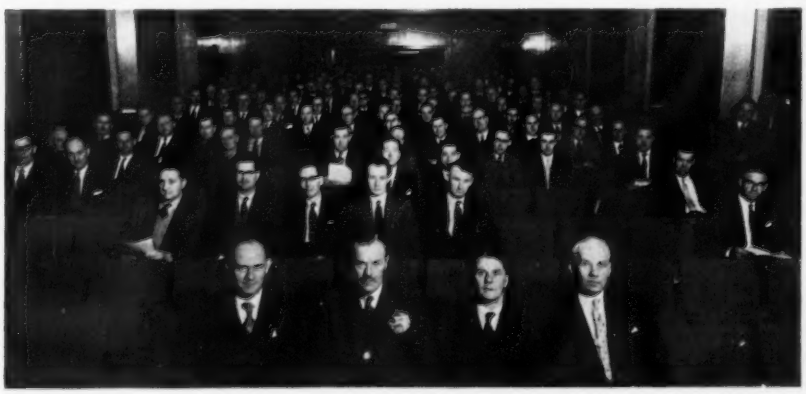
IES Activities

Industrial lighting conference, Birmingham

A one-day conference on Industrial Lighting was arranged by the IES Birmingham Centre at the College of Technology, Birmingham, on April 21. In opening the conference, Mr A. B. E. Lovett, HM Superintending Inspector of Factories, Birmingham Area, stressed the importance of the right quantity and quality of both natural and artificial lighting and their successful integration in industrial interiors. Dr W. E. Harper was unfortunately unable to be present to deliver his address on 'The Technical Basis of Good Lighting' and Mr J. G. Holmes deputized for him, dealing with the IES Code and its implications. After a break for coffee Mr H. R. Ruff introduced some of the latest developments in light sources and discussed their applications to lighting problems and Mr W. Robinson contributed a talk on 'Maintenance and Economics'. After lunch, which was served in the college refectory, Mr J. G. Holmes presented a collection of slides to illustrate his talk on 'Some Recent Installations and Particular Problems'. Question time elicited a lively discussion in which many of the 150 members and visitors, representing Midland industrialists, electrical contractors, architects, consultants and technical bodies, participated. A film, 'New Light on Industry', occupied the final half hour.

The President of the Society, Mr H. G. Campbell, congratulated the organizers, in particular Mr W. J. P. Watson, on the success of the conference and thanked those who had given talks and contributed to the discussions. He also thanked the College of Technology for the excellent facilities they had placed at the disposal of the Birmingham Centre.

Left, delegates at the Birmingham IES *Centre Industrial Lighting Conference. In the front row, left to right, Mr H. R. Ruff, Mr J. R. Yeates (Chairman), Mr A. B. E. Lovett (HM Superintending Inspector of Factories, Birmingham Area), and Mr J. G. Holmes. Below, the* IES *President with members of the* IES *South African Centre. Left to right, Mr H. K. Koerting, Mr H. L. Roston (Chairman), Mr H. G. Campell and Mr L. O. Foster (Secretary).*



Postscript

DO VICTORIAN GAS STREET LAMPS afflict you with nostalgia or are you too young to have spent your most impressionable years in a neighbourhood graced by these near-antiques? I have recollections of climbing them as a youngster on one or two occasions to witness colourful and historic scenes, of which we have had recent examples in the wedding of HRH Princess Margaret. I even have a sneaking regard for some of them on aesthetic grounds. But I have no urge to possess one of these lamps although it appears that about 1,000 people are anxious to acquire one of those which are being ousted from the streets of Chelsea by new columns carrying post-top lanterns containing fluorescent tubes. There are also residents of Chelsea who don't want the gas lamps to be replaced. One of these—in the immediate vicinity of whose house one of the new lanterns has been mounted at a height of 15 ft. in place of the old gas lamp which stood 12 ft. high—has actually sought an injunction to restrain the borough council from continuing to keep the new lamp unscreened where it is. In this case, however, irrespective of aesthetic considerations, it was alleged to be a nuisance because it shone into the resident's bedroom and disturbed her sleep. There must be other residents, in Chelsea and elsewhere, who have a street lamp so sited as to illuminate their bedrooms to some extent: what a headache local street lighting authorities would have if all such residents found this unbearable.

LUMINOUS CEILINGS have been followed by luminous walls although, as yet, the number of examples is small. A bedroom in New York has been treated in this way but another example exists nearer home in the new Paris Lighting Centre. Here, in one section, the luminous ceiling is continuous with a luminous wall constructed and lighted in the same manner, and the wall provides the background to a display of various electric lamps. In the case of the bedroom the luminous wall is behind the bed head. This is an interesting development. In this country something similar to it—though not so through-going—is to be seen in some shops where luminous plastic panels are used on walls or on display-carrying partitions. If this treatment is not overdone, so as to give one the impression of being enclosed in a photometric cube, it can be both useful and pleasing. It is invariably the case that when new materials are developed new applications for them are found. This is very true of plastics, but in fields of lighting what will follow luminous plastic walls?

AT THE RECENT CONGRESS of the Royal Society of Health more than one speaker was very critical of our house planning. One medical officer of health—Dr Irene Green—generalized about houses old and new as being 'cramped, draughty and ill-lit'. The six essentials which the family home should provide, said Dr Green, are shelter, warmth, safety, light, air and space. As to safety, she thought there is need for a new hymn—'For those in peril in their homes'—and she might have added that it is all too often bad lighting that militates against safety in homes, especially where there are elderly occupants. So far as council houses are concerned, the city architect of Coventry pointed out that it is all very well calling for more space, heating, extra lighting points, and this, that and the other, but the councils must provide the money to pay for them. Some of this money comes out of the taxpayers' pockets and not from the tenants. But merely providing extra lighting points may achieve nothing: better home lighting will come only if all necessary points are used effectively. Indeed, there seems to be no way of ensuring that good lighting in homes will be maintained even if proper provision for it is made in the first place.

THE EDITOR HAS PASSED TO ME an unusual matchbox sent to him by a well-known member of the IES. It is unusual because the label on the back of the box carries the heading 'Useful facts' and the particular useful fact described relates to 'Unkindly light'. The description runs thus: 'Some modern lighting makes faces look grey because its light does not contain the whole spectrum, as the sun's does, and therefore when a face reflects it back to the observer's eye, some colours, such as pink, are missing'. The almost sodium yellow of the label is the regular colour for the particular brand of matches: that it suggests what 'unkindly light' is referred to is merely coincidental.

THIS MONTH—in which the longest day occurs—reminds me of a conference recently arranged by the British Lighting Council at the Royal Institute of British Architects to discuss the question, 'Is daylighting really necessary?' What a question! The 'man in the street' would answer it in the affirmative without hesitation. But, of course, the question needs amplification. What was really being asked was, 'is daylighting really necessary for seeing *in* buildings or can it be replaced or supplemented satisfactorily by artificial lighting?' Freedom in building design is restricted if liberal interior daylighting is insisted upon and, in any case, it is impracticable for some modern standards of illumination to be mainatined in buildings for anything like the periods they are required. On the other hand, there is no difficulty in maintaining physiologically satisfactory artificial lighting. But this is not enough: artificial lighting should be made psychologically satisfactory as well if it is to do duty for daylighting when this is seen or known to be abundant outside. This may be more difficult although the difficulties are not insuperable. It calls for new techniques and for closer collaboration between lighting designers and building designers than is now the rule. In fact, it poses a challenge to both parties.

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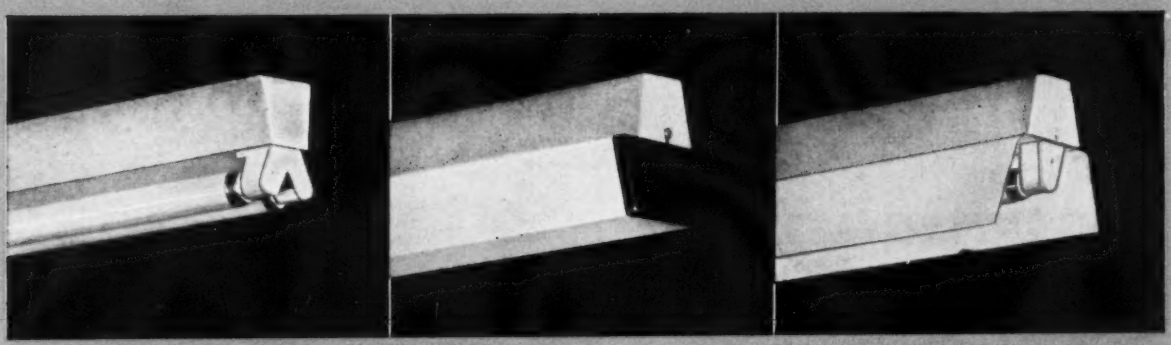
Here is G.E.C. reliability at budget prices. This new Paragon range includes the popular Osram 1 x 80w pack at £4.19.8. All patterns are cartoned complete with Osram guaranteed warm white tubes, and available one or two light.



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ECONOMY RANGE OF FLUORESCENT LIGHTING FITTINGS *including the* Osram 80W PACKS

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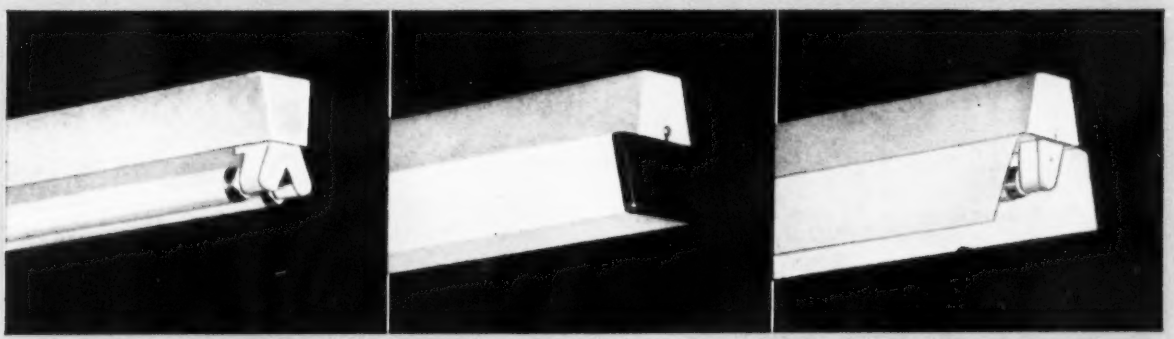

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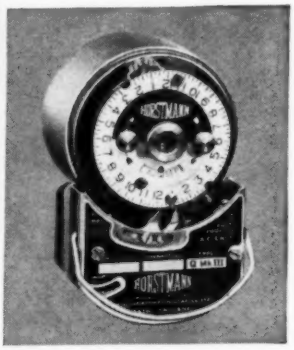

The Type Q Mark III Time Switch is a two circuit midnight reduction model with 10 amp. A.C. capacity per circuit.

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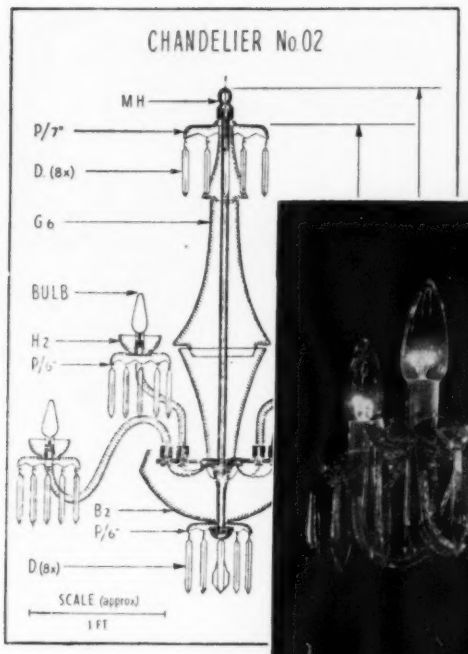

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STANTON

Prestressed Spun Concrete Lighting Columns

Stanton Type 8K/1 Spun Concrete Lighting Columns fitted with G.E.C. Z.8484 Fluorescent Lanterns at Bedford.

Photograph by courtesy of F. W. Dawkes, Esq., B.Sc. (Eng.), A.M.I.C.E., M.I.Mun.E., A.M.T.P.I., Borough Engineer & Surveyor.

The type shown is one of many Stanton designs approved by the Council of Industrial Design and acceptable to the Ministry of Transport for use on trunk roads.

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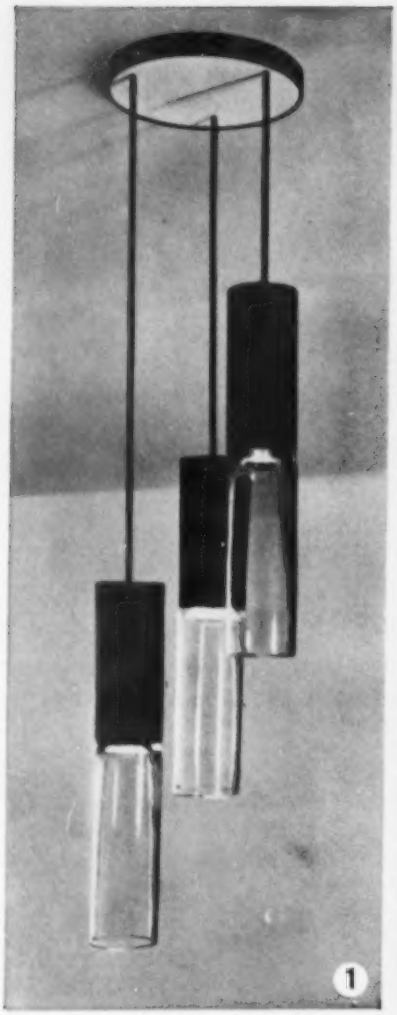

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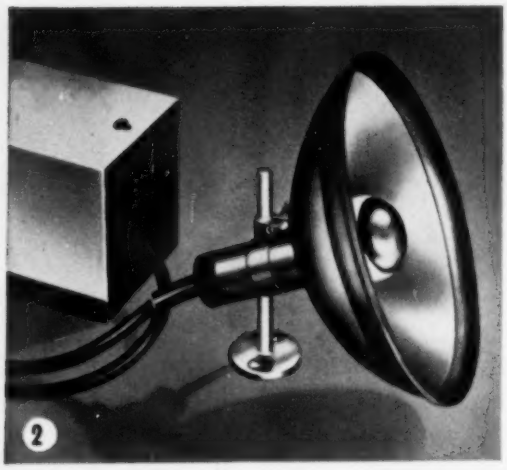

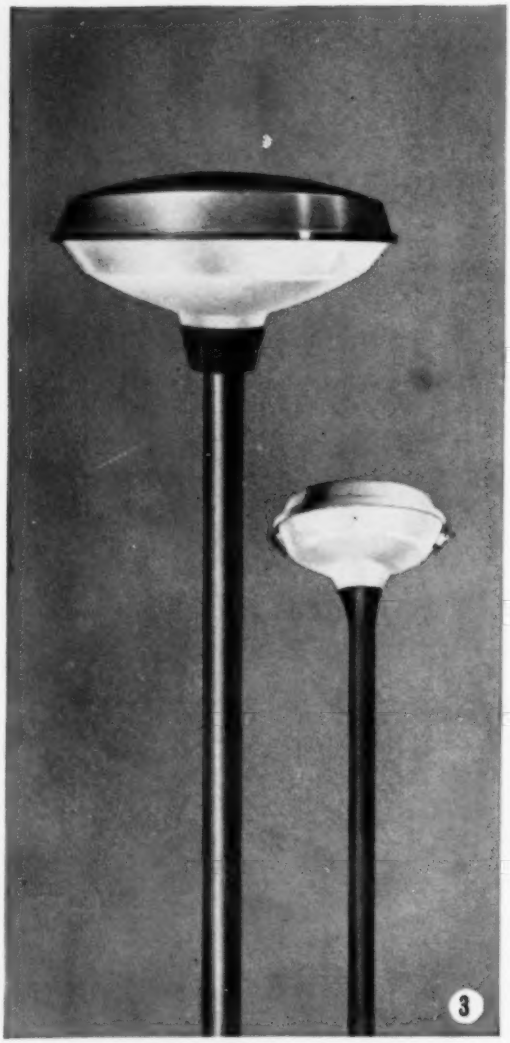

COUNCIL OF INDUSTRIAL DESIGN 1960 DESIGN AWARDS FOR ATLAS LIGHTING LIMITED

All the lighting fittings which this year won Design Centre Awards from the Council of Industrial Design are Atlas products. In addition Atlas Lighting Limited now becomes the first company to win three of these coveted awards in the same year.

This highlights the success of the Atlas design policy, which first gained 'official' recognition when the Atlas 'Kitchenlight' won similar distinction.

1. *'Chelsea' handwrought glass lighting fitting G.3 and JY Glasses.*
2. *Low Voltage Display Lighting fitting DB.0050 with Transformer TR2338.*
3. *Street Lighting Lanterns and Columns. Models Gamma 4 and Gamma 5.*

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